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INTERNATIONAL DEVELOPMENT ASSOCIATION

INTEGRATED DAIRY BEEF DEVELOPMENT PROJECT

KOREA

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Agriculture Projects Department

Public Disclosure Authorized

CURRENCY EQUIVALENTS

US$1	=	Won 305
Won 1,000	=	US$3.28
Won 1,000,000	=	US$3,280
Won 1,000,000,000	=	US$3,280,000

WEIGHTS AND MEASURES
(Metric System)

1 kilogram (kg)	=	2.20 pounds
1,000 kg - 1 metric ton	=	2,200 pounds
1 kilometer (km)	=	0.62 mile
1 hectare (ha)	=	2.47 acres
1 liter (l)	=	0.26 gallon
1,000 millimeters (mm)	=	39.37 inches
1,100 cubic centimeters (cc)	=	1 quart
550 cubic centimeters (cc)	=	1 pint
180 cubic centimeters (cc)	=	1/3 pint
0 degree centigrade (°C)	=	32° fahrenheit

GLOSSARY OF ABBREVIATIONS

AI	=	Artificial Insemination
AU	=	Animal Unit
AFDC	=	Agriculture and Fishery Development Corporation
GDP	=	Gross Domestic Product
KDBC	=	Korea Dairy Beef Company
NACF	=	National Agricultural Cooperative Federation

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INTEGRATED DAIRY-BEEF DEVELOPMENT PROJECT

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INTEGRATED DAIRY-BEEF DEVELOPMENT PROJECT

SUMMARY AND CONCLUSIONS

i. The Government of the Republic of Korea has requested Bank Group financing to assist the Korea Dairy Beef Company, Ltd. (KDBC) to carry out an integrated dairy-beef development project. This would be achieved by providing credit and technical services for the development of about 700 dairy farms, with 10 to 40 cows each, and the development of two modern dairy products processing plants to which Project farmers would deliver their milk under suppliers' contracts.

ii. The Project would be within Korea's on-going Four-Year Livestock Industry Development Program, which, under the Second Five-Year Economic Plan, 1967-71, is given high priority. Korea is endeavoring to narrow a widening disparity of income between the industrial and agricultural sectors through a policy of diversification and intensification: double-cropping paddy land, where suitable; developing idle slopelands for livestock production; and growing more high value products such as silk, mushrooms, fruits and vegetables. In the livestock sector the Program envisages dairy cattle imports; development of dairy farms through forage development on slopelands, today largely under-utilized; on-farm investments; and construction of dairy processing facilities.

iii. In addition to the two sub-projects of developing dairy farms and dairy processing plants, the Project would assist Government in developing a coordinated program of applied research and demonstration in livestock production. This sub-project would generate information needed as a basis for the long-range development of Korea's livestock resources.

iv. Total Project cost, including working capital during the disbursement phase, would be about US$12.6 million. About 63% (US$7.9 million) would be for dairy farm development, 20% (US$2.5 million) for dairy processing facilities, 15% (US$1.9 million) for technical services, and 2% (US$0.3 million) for working capital. An IDA credit of US$7 million would finance about 56% of total Project cost. Other financing would be provided approximately by: participating farmers, US$2 million (16% of Project cost but on average 25% of farm development cost); Government, US$1.5 million (12%); the Agriculture and Fishery Development Corporation (AFDC), US$1.3 million (10%); and KDBC, US$0.8 million (6%).

v. IDA funds for dairy farm development and technical services would be on-lent by Government to KDBC, Administering Agency, at 3% interest per annum for 15 years including a grace period of 6 years. Government counterpart funds would be made available on the same terms. IDA funds for development of two dairy products processing facilities would be on-lent by Government to KDBC at 9% interest per annum for 15 years including a grace period

of 6 years. KDBC in turn would make dairy farm development loans at 9% interest for 8 to 10 years including 2 to 4 years of grace. KDBC would construct and operate the milk processing plants and would have contractual agreements with participating farmers to purchase their milk. It would apply an incentive payment plan based on the quality of raw milk delivered to the plants.

vi. Procurement of Project goods would be by international competitive bidding for the equipment of the dairy processing facilities and local competitive bidding for such goods as vehicles. Price quotations would be obtained from at least three countries for importation of dairy heifers. Other investment items for dairy farm development would be purchased by project beneficiaries from local commercial sources.

vii. The economic rate of return of the Project is estimated at 12%. The financial rate of return to the dairy-beef producer is about 25%. At full development after about seven years, the smaller producer (about 10 milk-cows) would have a net annual cash balance after debt service of about US$2,600, being comparable to the net return from about 8 ha of paddy. The larger producer (about 40 milk-cows) would have proportionately higher net returns.

viii. By year-10, milk production resulting from the Project would be about equivalent to the total national production of 32,000 tons in 1969. Furthermore, domestic production of beef would be increased about 1,300 tons, or 5% of 1969 production, and approximately 3,700 female dairy animals annually would expand the domestic dairy herd.

ix. The Project is suitable for an IDA credit of US$7 million. The foreign exchange risk would be carried by KDBC the first 15 years and, thereafter, by Government when all IDA funds would be repaid by KDBC.

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INTEGRATED DAIRY-BEEF DEVELOPMENT PROJECT

I. INTRODUCTION

1.01 The Government of the Republic of Korea has applied for Bank Group financing to assist the Korea Dairy Beef Company, Ltd. (KDBC), a wholly owned subsidiary of its Agriculture and Fishery Development Corporation (AFDC), in financing an Integrated Dairy-Beef Development Project. The Project was prepared in 1969 by AFDC, in cooperation with consultants engaged by the Overseas Technical Cooperation Agency of the Government of Japan and two IBRD missions. It is part of the on-going Four-Year Livestock Industry Development Program within the framework of Korea's Second Five-Year Economic Development Plan 1967-71. This would be the Bank Group's second agricultural operation in Korea. The first Pyontaek-Kumgong Irrigation Project, Loan 600-KO, was approved in 1969 for US$45 million.

1.02 This report is based on the findings of a mission led by F. Knobel and composed of F. van Gigch (IDA) and D. King and M. Walshe (Consultants) that visited Korea in April/May 1970.

II. BACKGROUND

A. General

2.01 The Republic of Korea has a population of about 31 million, growing at a rate of 2.2% (1969), and a total land area of about 98,000 km^2. It consists of the southern half of a peninsula located on the China Coast, between the Yellow Sea and the Sea of Japan (Map).

2.02 The annual growth rate of real GNP during 1962-69 was about 11% and all major targets of the Second Five-Year Plan (1967-71), except those in agriculture, were exceeded by 1969. Export performance has also been impressive although it has not prevented further widening of the chronic merchandise trade gap developed since the early 50's. During the Second Plan, the annual rate of inflation has been about 10%.

B. Agricultural Sector

2.03 At present, about 2.6 million households farm nearly 2.3 million ha, producing principally rice, barley, pulse, potatoes, fruit

and vegetables. On the hills and steep slopes, which represent about 68% of the land, crops give way to about 6.7 million ha of idle woodlands covered with sparse pines. Heavy population pressure on land has resulted in subsistence agriculture on average holdings of less than 1 ha of cropland per household, and, although more than half of the population is rural, it contributes only about 30% of GNP. Yet agriculture is moving ahead. Progressive utilization of modern farming techniques and increases in the size of average holdings due to migration, land reclamation and consolidation, has made it possible to achieve an average annual agricultural growth rate of about 4% during the Second Plan. While this is impressive, it was one-fourth the rate of industrial growth and resulted in further widening the intersectoral income gap. Because it will take time for migration to substantially decrease the absolute size of rural population, fuller utilization of available cropland and development of idle but potential productive lands remain crucial in the effort to raise agricultural productivity and relative incomes.

Livestock Sub-sector

2.04 Cattle population is about 1.2 million head, mostly native Korean except for about 3,000 head of specialized beef breeds and about 14,000 dairy cattle (Annex 1). The number of Korean cattle has decreased by almost 10% since 1965 due to displacement of draft animals by mechanization and by slaughter encouraged by high beef prices. The pig population has been fluctuating between 1.2 and 1.5 million head, depending upon availability of feed, while poultry production on an industrial scale is making great progress. It reached more than 40,000 tons in 1968, second only to pork at about 90,000 tons.

2.05 Although livestock farming is secondary to crop farming, it will certainly grow in importance since there is substantial untapped land resources that could be profitably developed for cattle production. About 500,000 ha are unimproved slopelands (under 35° slope) covered with native pasture and sparse scrub, and about 200,000 ha are cropped upland and rainfed paddy fields marginally suited for crop production. In addition, about 700,000 ha of lowland irrigated paddy fields could be double-cropped in hay, silage or green feed, and about 1 million ha of idle woodland or rangeland is suitable for regeneration of plant coverage through oversowing, liming and fertilizing.

2.06 Beef production, estimated at about 36,000 m tons in 1968, is based on the slaughter of native Korean cattle, which are raised primarily for draft purposes. Korean cattle are extremely hardy and have a good potential for crossing with Friesian or Hereford. The average Korean farm has 1 to 2 head of cattle, which is sold when it no longer serves as a source of power. In recent years specialized fattening farms have been established but they are still minor sources of beef supply.

2.07 Dairy cattle in 1969 numbered about 14,000, up from 1,000 in 1961, principally because of the Government's policy of importing about 8,000 dairy heifers. Total production in 1969 was 33,000 tons of raw milk. The emerging dairy farming pattern is one of small farms of a five- to six-head average herd size, including heifers for replacement. Dairy farms are generally located around the main cities, principally Seoul, but urban expansion is forcing their relocation to other districts. Nearly all dairy farm operations are done manually, including milking. Farms are generally understocked, and the current stocking rate - about 2 ha per cow equivalent - can be greatly improved. Grazing is currently of minor importance and most farmers tend to feed excessive quantities of concentrates, reaching 3,000 to 4,000 kg per cow annually.

Dairy Products Processing Sub-sector

2.08 Koreans began milk processing operations for pasteurized bottled milk around 1962, for condensed milk in 1963 and for powdered milk in 1965. Except for the Seoul Milk Cooperative bottled milk plant, most factories are small. Total installed processing capacity in Korea on an 8-hr basis is about 46,000 m tons milk per year, and total production is about 30,000 m tons. Plants, however, are badly distributed; in the Seoul area, the bottled milk plants are already working more than an 8-hr day, and would be approaching a 16-hr day by 1973/74. Furthermore, this would be used up by increased production from outside of the Project. A new plant to be supplied with milk by Project dairy farmers in the Central District is planned under the Project which would serve the greater Seoul area (para 3.12). There is no plant of adequate size in the other Project area, Honam District, which is an important milk producing region. However, one is proposed under the Project (para 3.12). See Annex 2 for further detail on dairy products processing.

C. Animal Health

2.09 Animal health hazards are not a serious impediment to livestock production. Virtually all the common diseases, including tuberculosis, brucelosis, black leg (clostridium) and anthrax, have been recorded, but control measures, including vaccines and prophylactic measures, are readily available. There is no foot-and-mouth disease or rinderpest. Tick-borne piroplasmosis and anaplasmosis occur and could be hazardous to imported stock, but both are effectively controlled by spraying. Cattle can be protected against internal parasites, including liver fluke, by routine drenching. The two main production hazards are infertility and mastitis, 1/ particularly common to new dairy production areas worldwide. Available evidence

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1/ An infection of the milk glands that may cause serious loss in production and quality of milk.

suggests that infertility may be caused by a poor artificial insemination service, and most farmers need guidance in mastitis control. Strict quarantine and import regulations ensure that major diseases are not introduced through importations.

D. Agricultural Services

Research, Extension and Education

2.10 Agricultural research and extension services are provided principally by the Ministry of Agriculture and Forestry through the Office of Rural Development and the National Agricultural Cooperative Federation (NACF). Services are numerous and there are adequate facilities; however, the quality of livestock research and extension needs considerable improvement. A priority task would be to provide the farmer with simple input-output data on the production and yields of grain and forage and on fertilizer and concentrate use and to work out the management and husbandry systems best suited to the Korean environment. Current programs are deficient in meeting these needs but would be improved by provision of certain technical services included in the Project (para 3.18).

2.11 There are more than 180 agricultural high schools and 16 agricultural colleges, 13 of which offer training in livestock production, management and processing and in veterinary medicine. Short courses are available to farmers through the extension service. The Korea-German Pilot Dairy Farm, administered by NACF, and the Korea-New Zealand Demonstration Dairy Farm, administered by the Korea Dairy Beef Company (KDBC) (para 2.16), provide practical training in dairy production and management.

Agricultural Credit

2.12 The banking system has two main components: commercial banks and special financial institutions. Control and supervision are exercised by a Monetary Board through the Bank of Korea (Central Bank). There are five national commercial banks with head offices in Seoul and branch networks in the main cities, and, since 1967, six foreign banks. The commercial banks provide mainly short-term funds to commerce, manufacturing and the service sector. They make no loans to farmers and a minimal amount of credit goes to agro-industry and commodity dealers.

2.13 There are seven special financial institutions, one of which, the National Agricultural Cooperatives Federation (NACF), is designated by Government for lending direct to farmers and agricultural cooperatives. NACF is both a bank, receiving deposits and making loans, and a general cooperative institution that engages in a wide range of other activities, including marketing, supply and mutual insurance. Its credit operations

are the largest individual item, followed by supply and marketing activities. 1/ Interest rates on loans to farmers range widely from 3.5% (long-term irrigation) to 24% (fishery). Its short-term rate for agricultural production is 15% and medium-to-long term rate for livestock is 9% per annum. Its outstanding loan portfolio of around US$275 million equivalent is about equally divided between short-term and medium-to-long-term loans. Despite the growing supply of capital funds available to NACF, it is unable to meet the total credit needs of the agricultural sector and private borrowings are common at an interest cost of around 50% per annum. In order that the integrated approach envisioned for execution of the Project would be carried out and, furthermore, to correlate credit with competent technical services at the end-user level, NACF would not be a participant in the Project since these activities would be performed by KDBC (para 4.01).

AFDC and KDBC

2.14 AFDC was established by special legislation in 1967 to foster agro-industry development in Korea through financing equity investment and providing long-, medium- and short-term loans; encouraging domestic and foreign investments; providing technical and managerial assistance and training; developing domestic and export markets; and introducing an improved institutional framework. It has a qualified staff to provide management and technical guidance to its affiliated companies.

2.15 AFDC's investment policy is to sell its shares in an enterprise as soon as the project becomes viable and capable of independent management. The principal financial resource of AFDC is subscribed capital from Government, which was increased from US$10 million equivalent in 1968 to US$21 million in 1970 (total authorized capital is 10 billion Won - US$33 million). Its financial statements are shown in Annex 3.

2.16 KDBC was established by AFDC in February 1969 as one of its 22 diversified agro-industry investment projects. The objective of this enterprise parallels the national policy of fostering investments in the livestock industry to increase the protein food supply, while also providing the rural people with wider opportunities to increase their cash income. This objective may be achieved under the Project through a vertically integrated approach from the farm-level-production stage through the marketing-to-consumer stage. It also has responsibility for the development and operations of the Korea-New Zealand Demonstration Dairy Farm at Pyongtaek, some 50 km south from Seoul (Map). As administering agent for the Project, KDBC would be linked to AFDC by the financial support it would receive (para 3.20) and by the capable backstopping mentioned in paragraph 2.14.

1/ NACF handles about 60% of total supply needs of farmers and markets about 30% of farm products moving into commercial channels.

E. Agricultural Policies

General

2.17 A key problem of Korean agriculture is how to raise the level of farm income more nearly to that of other sectors (para 2.03). Until recent years, farm income policy was based largely on high rice price support. However, rice prices in Korea are already above those in the world market and further rises would have an unfavorable effect upon the general price level. The Government has, therefore, shifted its policy and now supports diversification through double-cropping of paddy fields, where suitable, and development of idle slopelands. Diversification is taking place also in the direction of high value products such as silk, mushrooms, fruits and vegetables and livestock production on slopelands 1/. In addition, the Government continues investing in irrigation, consolidation of lands and improved farm technology.

Livestock Policies

2.18 The principal guidelines for livestock development within the framework of the Second Plan are contained in the Four-Year Livestock Industry Development Program, 1968-71. This program encourages commercial production, individually and by cooperatives, of the major animal species, with emphasis in beef and dairy cattle. Participating producers receive priority to lease or buy public lands, are granted financial assistance for the purchase of cattle and for farm development, receive subsidies for pasture establishment and are entitled to tax relief measures. The program contains provisions for stabilizing feed prices and improvement of livestock marketing through the construction of processing facilities. In terms of dairy production, the Four-Year Program envisages cattle imports, development of dairy farms through pasture development on slopelands, on-farm investment and construction of dairy processing facilities. The Project would be a major factor in implementing these objectives.

2.19 The Dairy Farming Development Law of 1967 provides the institutional framework for dairy development. It empowers the Government to designate areas in which public lands cannot be used for any purpose other than dairying. The Project falls within designated areas. The Law also gives dairy farmers priority rights to purchase or lease private and public lands for pasture development. In addition, dairy farmers are exempt from business, property, and acquisition taxes. Processing facilities such as those envisaged under the Project would be exempt from corporate, business, acquisition, property and commodity taxes, as well as from custom duties, as is any corporation whose equity shares are controlled 51% or more by AFDC.

1/ Economic Position and Prospects of the Republic of Korea, EAP-12a, March 16, 1970.

III. THE PROJECT

A. Description

3.01 The Project would be vertically integrated, progressing from the production stage through the marketing stage. About 700 dairy farms would be developed to supply raw milk to two new processing and marketing facilities, and would contribute to the domestic supply of beef by the fattening of dairy steers. The Project would be confined to the development of uplands best suited for dairy production and for which a reasonable experience exists.

3.02 To serve the long-range development strategy of the livestock subsector, the Project provides for field trials within Project areas and outside to measure productivity of potential livestock resources. It also provides for development of Korean livestock production expertise through in-country training and overseas training grants.

B. The Project Areas

Central District

3.03 The Central District comprises four counties (guns) located in the provinces of Kyunggi and North Chungchong (Map), midway between the cities of Seoul and Taejon. The new four-lane Seoul-Pusan expressway and the Seoul-Pusan railroad cross the District, which has a good transport network. About 72,000 farm households produce principally rice, barley and wheat, pulses and potatoes on a total of about 54,000 ha of paddy land and 31,000 ha of uplands. It is estimated that the District includes about 6,500 ha of sparsely wooded slopes of less than 35° that could be profitably cleared for pasture development. Livestock population comprises about 31,000 native bred cattle, kept principally for draft purposes; about 1,000 head of dairy cattle; and about 26,000 swine. The climate is characterized by long, cold winters; fairly short and relatively dry autumns and springs; and hot summers, with high monsoon rainfalls during July and August. Average temperature is 12.5°C with a range of -5°C to 28.7°C. Rainfall averages about 1,200 mm. As in most of Korea, soils tend to be infertile, acid and low in organic matter, requiring heavy dressing with phosphorus, potash and lime for pasture production.

Honam District

3.04 Honam District includes six counties (gun) situated in North Cholla province, within a radius of 60 km of Kwangju city (Map). The District is served by the Seoul-Pusan railroad line and is expected to

have access to the Seoul-Pusan expressway during 1971. There are about 130,000 farms, with production patterns similar to those in the Central District, although a more benign climate permits more double-cropping of paddy lands, particularly with barley and wheat. Livestock production comprises about 36,000 native cattle, mostly draft; 600 dairy cattle; and 1,000 swine. It is estimated that there are more than 7,500 ha of sparsely wooded lands of less than 35° slope that can be cleared for pasture production. Soils and rainfall are similar to those in the Central District.

C. Detailed Features

Dairy Farm Development Sub-project

3.05 About 700 dairy farms would be developed, about equally distributed between the Central District and Honam District. Typical prospective participating farmers are those now producing rice, barley and vegetables on paddy land and cropland. Generally the farms include a variable quantity of unused uplands suitable for pasture development. Korean farmers take good care of their animals and farmers who have gone into the dairying business in recent years show a high level of animal husbandry. Participating Project farmers would receive 8- to 10-year loans from KDBC to finance land clearing, pasture establishment, dairy heifers and artificial insemination (AI), farm structures, dairying equipment, and machinery. Loans would be made on the basis of approved farm plans (para 4.07). Short-term financing if needed to cover operating expenses during the development years would be available from several Special Government Funds.

3.06 Types of Farms and Phasing. Development would take place on two types of dairy farms: small farms with an average capacity of 10 cows, ranging from about 5 to 15 cows (5 to 15 ha); and medium to large farms from about 20 to 40 cows (15 to 50 ha) (Annex 4). During Project year-1, on-farm development would start in the Central District on about 200 small farms and about 35 medium to large farms. During Project year-2, the same pattern would be followed in the Honam District. For the following two Project years, development would be of an almost equal rate in both districts. Development on each farm would be phased over three years but milk production would begin in farm year-2 to -3. The total on-farm development program would be phased over five years.

3.07 On small farms, an average of about 10 ha would be developed for grass and forage crops. Animals would be housed in conventional stall-barns and, in general, machine milked. One man would manage 10 cows, including the farming operations. Farm machinery provided under the Project would include a small hand-tractor plus attachments for cultivation, silage and forage cutting equipment and usually a small milking machine. Since the seasonal demand for labor is becoming increasingly critical, a milking machine would fill

this gap. Also, it would be more economical as it would be less than the cost of one year-round laborer that it would replace. Small type milking machines are common to Japan. Farmers would be encouraged to build inexpensive bunker-type silos.

3.08 On medium to large farms, an average of about 35 ha would be developed for pasture and forage. Cows would be housed in loose cubicle or free-stall-type buildings with access to an open yard and self-feed silage. Cows would be milked in a milking parlor, and a pipeline milking plant would be installed. Machinery provided under the Project would include four-wheel tractors and attachments and forage harvesting and milking equipment.

3.09 Under the Project, concentrate feeding would be confined to around 1,000 kg and 700 kg annually per head of milk cow and dry stock, respectively; a drastic decrease over usual levels in Korea (para 2.07). Farmers would be encouraged to use grazing. It is expected that such a practice would be more common in the larger units for which fencing is provided under the Project.

3.10 Pasture Development. A key element of on-farm development would be the development of idle, low rolling hill land. At least 14,000 ha are readily available in the two Project areas (paras 3.03 and 3.04). Development would include clearing of brush, plowing, leveling, fertilizing and sowing with grasses and legumes. On small farms, development generally would be done manually, as is traditional in Korea, but on large farms, mechanized equipment, provided under the Project, would be used. On both types of farm, clearing and pasture seeding would start during farm year-1 to provide enough forage feed in farm year-2 to support the cattle. Based on available experience, the most promising pasture species for Project areas are cocksfoot, bromegrass, tall fescue, timothy, ladino and red clover and alfalfa. Maize, forage sorghums and sudan grass grow well and would be used for silage and forage production for winter feeding.

3.11 Cattle. Participating dairy farms would be stocked with high-grade Friesian weaner heifers weighing around 225 kg, 8 to 10 months old and not mated. Cattle would be imported with proceeds of the proposed IDA credit. It is estimated that small farms would receive, on average, 7 heifers and medium to large farms about 15. The heifers would arrive during the second year of farm development and may be held for short intervals on the Korea-New Zealand 220-ha dairy farm until they could be moved to participating farms. They would be artificially inseminated with imported semen at 12 to 15 months and calve down beginning in the second and the third year at about two years of age. The resulting male calves would be fattened on participating farms until the sixth to seventh year, when full carrying capacity for female stock would be attained. From then on, a flow of weaner steers would be generated by Project farms for fattening elsewhere.

Dairy Products Processing Sub-project

3.12 Funds are provided in the Project for the construction of two dairy processing facilities, one to serve the Central District and the other for the Honam District (Annex 5). The Central District facility would be designed principally to supply whole milk to the greater Seoul area while the Honam facility would process baby foods and whole milk for the Kwangju city area. The latter would utilize raw materials produced locally and seasonal milk surpluses from the Central District. Project funds would also finance consultant services to design and draw up specifications for the facilities and to provide technical services during the startup period of plant operations (Annex 6).

3.13 Central District. Facilities would consist of (a) a collecting station, (b) a milk processing plant, and (c) three distribution stores. Construction would be completed in Project year-2 so that operations would be coordinated with the expected milk flow from the participating farms (para 3.06).

3.14 The collection station would be constructed near Chonam, in the center of the District, for the convenience of participating farmers. The milk delivered to the collecting station would be cooled, bulked and tankered some 80 km to the processing plant close to Seoul, or, in case of seasonal surpluses, to the Honam processing plant. Although the Seoul plant would initially pasteurize, homogenize and bottle milk, provision has been made to add a second line for whole flavored milks in the second year of plant operation and an ice cream plant in the third year. To keep vendors' delivery distances short and to ensure that milk is cold when it reaches the consumer, provision has also been made for three refrigerated distribution stores. Vendors would purchase milk from these stores or from the factory for delivery to customers by specially equipped bicycles.

3.15 Honam District. Facilities would consist of one collecting-processing plant and one distribution store, both located in or near Kwangju city. Construction of these facilities would be completed in Project year-3 so that operations would coincide with the beginning of milk production from participating farms (para 3.06).

3.16 Major equipment, which would initially be for processing infant powdered milk formula, would include a continuous evaporator and spray drier. Equipment would also be provided for batching and mixing both liquids and powders to various formulae and for packing in bags or nitrogen-filled cans. In the third year of plant operation, more simple bottling equipment than that installed in the Seoul plant would be provided, along with a refrigerated distribution store and special transport, as in the Central District. A small butter plant to process the offtake from fat standardizing and a small batch condensed milk plant have also been allowed for.

3.17 Plant Design, Construction and Startup. Detailed factory planning, construction and startup would be handled by Koreans with KDBC, assisted by a Dairy Processing Specialist or consultants (para 4.03).

Livestock Production Applied Research Sub-project

3.18 The Project's Technical Services would also include specialists in Agronomy and Animal Nutrition (para 4.04). Their functions, in addition to giving guidance to Project farmers, would be to assist Government in developing a coordinated program of applied research in livestock production to generate the information that would provide the basis for the long-range development of Korea's potential livestock resources. General trials on plant production, nutritional feeding requirements and dairy management would be carried out on the Korea-New Zealand Demonstration Dairy Farm, as well as on Project or other suitable farms. Presently, the Korea-New Zealand farm is geared only to the production of forage feed for the dairy herd and a somewhat rigid regime of dairy production. It would be a desirable base, however, for carrying on general trials on plant production, nutritional feeding requirements and dairy husbandry practices; however, technical expertise would be needed for this program of research. Also it would be desirable to develop information on forage crop production, double-cropping of lowland paddy fields and pasture development on uplands on each of three watershed areas (Map) covered by an ongoing UNDP/FAO Korean Uplands Development and Watershed Management Project (Annex 1, para 22). Contacts with the management of the Korea-New Zealand dairy farm and the UNDP/FAO project indicated that close cooperation with the Project could be expected, and, furthermore, KDBC would investigate the possibility of obtaining bilateral aid. The Project specialists would cooperate with local professionals on the design and choice of methodology of these research projects and would supervise their execution. An agreement would be made between Ministry of Agriculture and Forestry and KDBC that would include the scope and methodology of work; the amount and source of logistical support including personnel and materials; and administrative responsibility. Such agreement would be subject to the review and approval of IDA. Appropriate assurances to this effect were obtained during negotiations.

D. Cost Estimates

3.19 Total Project cost, including working capital requirements during the disbursement phase, is estimated at US$12.6 million. These estimates are based on prevailing local prices and include a contingency allowance of about 10%. The Project's estimated foreign exchange component is about US$6 million, or about 48% of total Project cost. The detail of investment costs by major categories and estimated foreign exchange components are given in Annex 7 and summarized in the following table.

Total Project Cost

Category	Won (billion) Local	Foreign	Total	US$ (million) Local	Foreign	Total	% of Total Project Cost	% of Total Foreign Exchange Component
Dairy Farm Development	1.1	1.3	2.4	3.7	4.2	7.9	63	53
Dairy Processing Facilities	0.4	0.4	0.8	1.3	1.2	2.5	20	48
Management and Technical Services	0.4	0.1	0.5	1.3	0.6	1.9	15	32
Subtotal	1.9	1.8	3.7	6.3	6.0	12.3	98	49
Working Capital	0.1	-	0.1	0.3	-	0.3	2	-
Total	2.0	1.8	3.8	6.6	6.0	12.6	100	48

E. Proposed Financing

3.20 The total cost of the Project would be financed as follows:

Category	IDA (US$m)	(%)	Farmers (US$m)	(%)	AFDC/KDBC (US$m)	(%)	Government (US$m)	(%)	Total (US$m)	(%)
Dairy Farm Development	4.4	56	2.0	25	-	-	1.5	19	7.9	100
Dairy Processing Facilities	2.0	80	-	-	0.5	20	-	-	2.5	100
Management and Technical Services	0.6	32	-	-	1.3	68	-	-	1.9	100
Working Capital	-	-	-	-	0.3	100	-	-	0.3	100
Total	7.0	56	2.0	16	2.1	16	1.5	12	12.6	100

On the above basis, IDA funds would finance about 56% of dairy farm development, 80% of dairy processing facilities, 32% of management and technical services, or about 56% of total Project cost. This would mean that in addition to the foreign exchange component of about US$6 million, IDA would finance US$1 million local currency expenditure. Other sources of financing would be as follows: participating farmers would contribute on-average 25% of new on-farm investments in cash, labor and kind (US$2 million equivalent) and Government would provide counter-part funds (US$1.5 million equivalent). ADFC would increase its equity capital in KDBC by about US$1.3 million to be used for construction of the dairy processing facilities (US$0.5 million), Project management and technical services (US$0.5 million) and working capital (US$0.3 million); and KDBC would finance the other part of the Project start-up expenditures (US$0.8 million) for management and technical services from its own resources. Assurances were obtained during negotiations with respect to financing Project costs.

F. Procurement

3.21 Dairy heifers and semen would not be subject to international competitive bidding because the type and quality of stock needed can be obtained only from a few countries specializing in their breeding and export. However, an element of competition would be introduced by requiring quotations from at least three countries. Dairy heifers, as well as semen, would be purchased under the close supervision and approval of the Dairy Husbandry Specialist (para 4.03) with respect to age, quality and suitability of stock. Certification of the Director, National Animal Quarantine Station, Ministry of Agriculture and Forestry, on animal health standards would also be obtained. (See Annex 1, paras 25 to 27, regarding the import of dairy stock.) Assurances with respect to importation of dairy stock and semen were obtained during negotiations.

3.22 Other goods required for dairy farm development such as farm machinery, dairying equipment, fencing, fertilizers, seeds, and farm structures would be obtained through existing commercial channels. International competitive bidding would not be appropriate since individual contracts would be small and numerous and the size and combination of farm investments would vary considerably. Imports having a high foreign exchange component, such as agricultural machinery and dairy equipment, are imported from Japan, United States, Australia and countries in Western Europe. There are no discriminatory import quotas or controls. Imports of cattle, farm machinery, and dairy equipment are exempt from import duties.

3.23 International competitive bidding would be applied for the purchase of machinery and equipment for both dairy processing facilities. It is possible that local suppliers may bid and win contracts for such goods as stainless steel tanks, milk cans, milk bottles, and small (10 HP) electric motors equivalent to about US$200,000. Internationally procured goods exceeding US$25,000 would be subject to IDA's review and approval. Construc-

tion of the dairy processing facilities would be by Korean contractors under competitive bidding. There are many experienced and qualified contractors to ensure good quality performance. The siting, plans, specifications, procurement, and construction contracts for the dairy processing units would be subject to the approval of the KDBC Technical Director - Dairy Processing Specialist, or equivalent consultant service. Assurances with respect to international procurement of dairy plant equipment and approval of specifications for both plants by IDA were obtained during negotiations.

3.24 Local competitive bidding would be followed for the few vehicles and motorcycles required for the management and technical services component of the Project. Several local assembly plants ensure a competitive and adequate supply.

G. Disbursement

3.25 The IDA credit would be disbursed as follows:

- Dairy Farm Development (excluding imported cattle and semen), 56% of the funds disbursed by KDBC to participating farmers;
- Imported Cattle and Semen, 100% of foreign expenditures;
- Dairy Processing Facilities, 100% of foreign expenditures for imported plant machinery, equipment, milk-tankers and trucks or 100% ex-factory cost of locally procured equipment, and 44% of civil works expenditures;
- Management and Technical Services, 100% of total expenditure including salary, emolument, international travel, housing, and other allowances of specialists in Dairy Husbandry, Dairy Processing, Agronomy and Animal Nutrition; 100% foreign expenditure for laboratory equipment, research materials including seeds and fertilizers for field trials, and international travel of trainees; and 100% of total expenditures for transport equipment such as jeeps and motorcycles.

KDBC would certify and submit to IDA the suppliers' invoices and other appropriate documentation.

3.26 As shown in the following schedule, the disbursement period would extend over five years:

Category	US$ (thousands) by Project Year					
	1	2	3	4	5	Total
Dairy Farm Development	400	1,300	1,500	1,000	200	4.4
Dairy Processing Facilities	-	500	800	300	400	2.0
Management and Technical Services	200	150	100	100	50	0.6
Total	600	1,950	2,400	1,400	650	7.0

The phasing of disbursements for each major investment category and the forecast of estimated disbursements on a quarterly basis are shown in Annex 9.

H. Auditing

3.27 KDBC would maintain separate accounts for the several components of the Project, i.e., dairy farm loans, dairy processing facilities and technical services. It would submit quarterly and annual reports to IDA within 30 days of the close of the respective periods. Its financial statements, audited annually by an independent accounting service acceptable to IDA, would be submitted to IDA within 90 days of the close of the fiscal year. Assurance with respect to Project accounts and audit were obtained during negotiations.

IV. ORGANIZATION AND MANAGEMENT

A. Administration

4.01 As key administrative agency for the Project, KDBC would expand its staff to about 25 professionals and would have five departments--administration, technical services, dairy processing, marketing, and finance (Annex 10). Each would be headed by a Korean director, under the President and Vice-President. Technical Services and Dairy Processing would be the two most important departments for Project execution. Technical Services would be directly responsible for the fulfillment of dairy farm development, supervision of farm plans and applied research in livestock production. Dairy Processing would be responsible for development and operation of the two dairy processing units. Any appointments made during the disbursement period of the Project with respect to the heads of these two departments plus the positions of President and Vice-President would be after consultation with IDA. Assurances to this effect were obtained during negotiations.

4.02 The capital of KDBC would be increased from its present authorized capital of 150 million Won (US$490,000) to 600 million Won (about US$2 million) to give it the financial resources needed (para 3.20) to implement the Project. It would be a condition of effectiveness that KDBC's financial structure had been established to IDA's satisfaction.

B. Management and Technical Services

4.03 The Technical Services Department, headed by a Korean Director, would be assisted by a Dairy Husbandry Specialist as a Technical Director. Primarily, he would be responsible for the development, approval, and supervision of about 10 Korean livestock production technicians employed and paid by KDBC. A Dairy Processing Specialist, or an equivalent consultant contract service, would be attached to the Dairy Processing Department as Technical Director. He would be responsible for approving the location, design and specifications of the two dairy processing facilities as well as supervising construction, procurement and installation of equipment, and management of startup operations.

4.04 Other technical services, Project-oriented, would have an impact on the further development of the Korean livestock industry (para 3.18). These would include: (a) an Agronomy Specialist responsible for determining the most economic and feasible kinds of forage feed and methods of production, and for formulating and carrying out a forage seed multiplication scheme; (b) an Animal Nutrition Specialist to conduct feeding trials to determine the most economic feeding regime for different categories of livestock; (c) an AI service to ensure the success of breeding unmated heifers imported under the Project; and (d) overseas training fellowships for Korean agriculturists in countries with similar ecological and environmental conditions.

4.05 An AI service would not only ensure that an efficient service would be available to Project dairy farmers but would also assist Korea toward fulfilling one of the needs for the long-term development of its livestock industry (Annex 1, paras 31 to 33). This service would include a small laboratory building and equipment for the storage and processing of imported frozen semen and transport and training for Project livestock production technicians and about 10 inseminators. IDA finance is provided for this component of the Project if such technical services cannot be obtained by KDBC from a bilateral aid source or contract supplier of semen.

4.06 It is anticipated that the Dairy Husbandry Specialist, Dairy Processing Specialist and Agronomy Specialist would be recruited from outside Korea. The animal Nutrition Specialist could be a Korean for whom out-of-country job-related training for 6 to 12 months would be desirable. Terms of reference for these specialists are shown in Annex 11. During negotiations,

assurances were obtained that the qualifications, functions and contracts of the four technical specialists would be subject to IDA approval. Furthermore, employment of the Dairy Husbandry Specialist would be a condition of effectiveness and the other specialists would be on-board within about 7 months from the date of signing the credit.

C. Lending Operations

Policies

4.07 Applications for dairy farm development loans would be submitted by farmers to KDBC livestock technicians located in the Project area. Based on farm development plans prepared by the technicians in cooperation with the farmer-applicants and approved by the Technical Director-Dairy Husbandry Specialist, loans would be granted after approval by the General Manager and Head of the Finance Department, KDBC. Principal security for a loan would be a grassland mortgage and an assignment by the borrower on his milk sales to KDBC milk plants in an amount sufficient to cover the payment terms of his contract. Also, the borrower would pledge an insurance policy under the national livestock insurance program administered by NACF.

Financing Terms for Farm Loans and Dairy Products Processing Plants

4.08 The terms for IDA funds and Government funds are summarized in the following schedule:

	Interest (%)	Term of Loans (Years)	Grace Period (Years) (Usual IDA terms)
IDA funds to Government			
Government and IDA funds to KDBC-Dairy Farm Development	3	15	6
KDBC to farmers	9	8-10	2-4
IDA funds to KDBC-Dairy Processing Plants	9	15	6

A term of 15 years for IDA and Government funds to KDBC is predicated on the making of 10-year farm loans in Project year-3, plus an allowance for slippage of one to two years. Assurances during negotiations were obtained from Government and KDBC with respect to these terms. A spread of 6% on funds used by KDBC for dairy farm development would be needed to cover its administrative costs, credit risk on sub-loans and the foreign exchange risk on the full IDA credit which would be repaid to Government over a period of 15 years. An interest charge of 9% for IDA funds that would be used for the milk plants is reasonable in view of their strong financial viability (Annex 12).

V. PRICES, MARKETS AND PRODUCER BENEFITS

A. Markets and Prices

Markets

5.01 Government intervention in pricing and marketing of livestock products is minimal. Korea has been a milk consuming country for a relatively short time. However, with the demand for all animal protein foods rising rapidly, the market outlook for dairy products is good. In order, however, to make a reasonable demand forecast, it is necessary to draw on the experience of Japan, which has a longer milk consumption history, initial dietary patterns similar to those in Korea, and development along lines now being followed by Korea.

5.02 The region of Kyushu in Japan has a per capita income of about US$250 equivalent, which is midway between the overall average for Korea and that for Seoul. Fluid milk consumption in Kyushu is about 7 kg per capita annually compared with about 1.6 kg in Seoul. For the purpose of the Project, it was conservatively assumed that per capita consumption of fluid milk in Seoul by 1975 would be at least half as much as the current consumption rate in the Kyushu area. Assuming then that the amount of fluid milk consumed in Seoul in 1975 would be in the same proportion as it was in 1969 to the total of all milk consumed in any form in the rest of Korea, overall consumption of dairy products would reach about 90,000 m ton. Assuming further that overall milk consumption in Korea would grow beyond 1975 at the same rate as estimated for 1969-75, overall consumption of dairy products in 1980 would be about 150,000 m ton. Thus, commercial channels could comfortably absorb expected production, which is estimated at about 135,000 m ton, including the output of the proposed Project. In addition, Korea has a school lunch program that absorbs the equivalent of 60,000 m ton of fluid milk, provided as milk powder by USAID. This constitutes almost the entire milk products imported by Korea. USAID intends to phase out its contribution to this program on the understanding that it will be progressively substituted by locally procured milk. Up to the present, however, no supply from local sources has been forthcoming. Should it materialize, additional investment in dairy development in Korea may be required much before 1980, and could well be an important part of a possible Phase II project before then.

5.03 Along with dairy products, prices for beef have been continuously rising with the increase in the demand for these products. Fresh meat prices doubled from about 300 Won/kg in 1966 to about 600 Won/kg in 1969 (US$1 to $2/kg). There is little grading of beef and prices usually are based on volume. Though the distribution system of livestock and livestock products follows traditional practices, the system is fairly efficient. There are some 600 registered livestock markets, mainly of three different types: small local market, medium local market and large city market, all under the control

of livestock or agricultural cooperatives. Dealings at the market centers are negotiated, usually by a broker who may charge a 2% commission. Slaughterhouse facilities at major market centers - Seoul, Pusan, Taejan, Osam - are modern and well operated. The beef market outlook is good and existing channels are adequate for the beef that would be produced under the Project.

Prices

5.04 The retail price of fluid milk is 20 Won per 180-cc bottle (equivalent about US$0.07 per 1/3 pint), and is not out of line with prices prevailing for similar products in other countries when allowance is made for the overvaluation of the Won (para 6.03). The retail price of baby food, the main type of milk powder to be processed under the Project, is 300 Won per 500 g can (equivalent, about US$1.00 for 1.1 lb) (para 6.04). Commercial imports of dairy products into Korea would require authorization of Government and would be subjected to import tariffs of 80% to 150%.

5.05 Compositional quality of raw milk varies as a result of lack of incentive payments but can be solved by paying for milk according to quality (Annex 2, paras 36-38). An appropriate sliding price scale would be 1.5 Won/kg per 0.1% fat differential above or below a basic payment for 3.2% fat milk value. During negotiations, assurances were obtained from Government and KDBC that a satisfactory incentive quality milk payment plan to producers would be applied under the Project.

B. Producer Benefits and Revenue Generation

5.06 Dairy farmers are expected to achieve sufficient increments in disposable income as a result of investing under the Project to encourage their participation. It is estimated that, at full development, after about seven years, the average small farm would achieve a net annual cash balance, after debt service, of about 0.8 million Won (US$2,600, Annex 4, Table 4) equivalent to the estimated net cash income of about 8 ha of paddy fields. In the case of medium to large farms, the net annual cash balance would be about 3.0 million Won (US$10,000, Annex 4, Table 8), comparable to the net cash income of 30 ha of paddy fields. The estimated financial rate of return on dairy farm investment is about 25%, which is satisfactory for a Project of this nature. The sensitivity of these results was tested, changing the value of selected variables. Financial returns were alternatively computed: decreasing the price of milk by 30%; increasing the cost of foreign exchange by about 30%; doubling and reducing by one-half the cost of concentrate feed; and decreasing by 15% the milk yield per cow. The lowest returns corresponded to a decrease in the price of milk and were of the order of 15%. The analysis thus suggests that the expectation of satisfactory returns to on-farm investment under the Project is warranted (Annex 12).

5.07 Farmer's total incremental incomes are composed of sales, net of operating expenses, plus cattle retained to build up the herd. These reten-

tions are a measurable source of savings that can be taken as the lower limit of personal savings generated by the Project. It is estimated that savings in the form of cattle retention during the life of the Project would be about 27% of farmers' total incremental farm incomes. Furthermore, dairy farmers in Korea are reinvesting extensively in their farms and it is likely that Project farmers would similarly reinvest their savings. There would be virtually no public savings, except for the surpluses achieved by KDBC in the operation of the dairy processing facilities, since participating farmers would be exempt from paying most forms of taxes (para 2.19). At about year-8, dairy processing facilities would produce a net cash income after debt service of about 400 million Won per year (US$1.2 million).

VI. ECONOMIC BENEFITS AND JUSTIFICATION

6.01 The Project would assist Korea in initiating the development of a considerable, but undeveloped, livestock potential. Under the Project, about 9,000 ha of idle, medium sloping hills would be brought into production, expanding the meager land basis of Korea and thereby increasing agricultural income and raising domestic availability of protein foods. It is expected that, after about 10 years, milk production under the Project would amount to about 32,000 ton, about equivalent to the national production during 1969 (para 2.07). It would be retailed principally in the form of baby foods and bottled milk. At the same time, the Project would produce an annual crop of weaner steers, which, once fattened, would increase domestic production of beef by about 1,300 m ton, equivalent to 5% of production during 1969. In addition, the Project would produce about 3,700 head of female dairy cows annually, many of which would serve to expand the domestic dairy herd.

6.02 The most important benefits of the Project are more difficult to quantify. There would be field trials on the utilization of various types of land resources now unproductive but which appear capable of providing the basis for a substantial expansion of the Korean livestock industry. Modern technology in livestock production would be introduced in an agricultural milieu traditionally oriented to crop production; local livestock production expertise would be developed through in-service training and training abroad; an efficient service of AI would be promoted, not only to serve the Project, but to provide the basis for the improvement of the native breed for beef production, and local production of pasture and forage seed adapted to the Korean environment would be encouraged.

6.03 The economic rate of return of the Project is estimated at 12% (Annex 13). It was arrived at by aggregating the expected financial cash-flows of Project farms and processing plants, and deducting the Project's management and technical services costs. To reflect the scarcity of foreign exchange in Korea, a shadow rate of exchange about 20% to 40% higher than the current rate of 305 Won/US$ was used to price the foreign exchange component of the Project. Furthermore, the value of the Project output was also adjusted on the basis of international prices - valued at the assumed shadow

exchange rate - to show the savings realized when goods similar to those produced under the Project do not have to be imported.

6.04 For economic rate of return computations, the baby foods produced under the Project were valued at the estimated wholesale price of similar products mixed in Korea but utilizing imported ingredients. The price of such substitute is about 25% cheaper than the local product. The economic valuation of bottled milk presents a more complicated problem. While bottled whole milk is not traded in world markets, some indication of the economic desirability of producing bottled milk in Korea can be obtained by comparing prices in other countries. The retail price of bottled milk to be sold under the Project - 20 Won per 180 cc - is in the upper range of retail prices in a sample of countries with long traditions of milk consumption. Furthermore, the Korean product would be retailed in a labor-intensive form at a cost of about 4 Won per bottle, which most probably overestimates the opportunity cost of the labor involved. Retailing milk in small bottles to fit the particular pattern of consumption of Korean buyers is inherently more costly than retailing in larger containers, as is common in other countries (Annex 2, para 41). Allowing for the overvaluation of labor involved in retailing and for the cost of retailing in small volume, it is estimated that the retail price of bottled milk in Korea lies between 16 to 17 Won per 180 cc, or about 15% higher than the highest retail price in Northern Europe. Accordingly, the value of fluid milk produced under the Project was scaled down by that amount.

VII. RECOMMENDATIONS

7.01 During negotiations, agreement was reached with respect to the following substantive issues:

(1) Government would:

(a) cause the Ministry of Agriculture and Forestry to:

(i) enter into an agreement with KDBC to conduct an applied research program in livestock production (para 3.18);

(ii) permit the importation of dairy cattle, principally young, unmated heifers, and semen (para 3.21);

(iii) support an incentive milk payment plan to suppliers of raw milk to KDBC milk plants (para 5.05); and

(b) on-lend the proceeds of the IDA credit directly to KDBC and advance Government funds, via AFDC, to KDBC upon terms and conditions satisfactory to IDA (paras 3.20 and 4.08).

(2) KDBC would:

(a) obtain the approval of IDA with respect to specifications for dairy processing facilities and for international procurement of dairy processing machinery and equipment exceeding US$25,000 in value (para 3.23);

(b) during the disbursement period of the Credit, make any appointments to the positions of President, Executive Vice-President, and Heads of the Technical Services and Dairy Processing Departments only after consultation with IDA (para 4.01);

(c) submit to IDA for its approval the qualifications, duties and contracts for the employment of specialists in Dairy Husbandry, Dairy Processing, Agronomy, and Animal Nutrition (para 4.06); and

(d) make long-term loans for dairy farm development on terms and conditions satisfactory to IDA (para 4.08).

7.02 In addition to the customary conditions, the following have been agreed upon as conditions of effectiveness of the proposed Credit:

(a) that KDBC was adequately capitalized (para 4.02); and

(b) that a Dairy Husbandry Specialist satisfactory to IDA was employed (para 4.06).

7.03 The Project is suitable for an IDA credit of US$7 million to the Republic of Korea. The foreign exchange risk would be carried by KDBC during the first 15 years when it would have the use of IDA funds. Thereafter, Government would bear the risk since it would have the use of these funds for general purposes.

January 11, 1971

KOREA

INTEGRATED DAIRY-BEEF DEVELOPMENT PROJECT

The Livestock Sub-sector

A. Dairy-Beef Production

Introduction

1. Livestock farming in Korea is of secondary importance to crop farming and until recently, cattle were raised primarily to be draft animals. The number of Korean cattle has decreased by almost 10% in the last five years due to displacement of draft animals by mechanization and a high beef price that encourages slaughter. Dairy farming has developed during the last decade with the importation of Friesian cattle. At present, Government policy, by legislation, subsidies and low interest loans, strongly encourages the development of livestock farming.

Beef Production

2. Beef production is predominantly based on the slaughter of native Korean cattle. Out of a total cattle population of approximately 1.2 million, less than 3,000 are imported beef breeds - Brahman, Hereford and Aberdeen Angus. The average Korean farm has 1 ha of cultivated land and 1.2 head of cattle. Specialized fattening farms - a new enterprise in Korea - buy cattle in the open market, two to three years old or over, and sell after an intensive feeding period of approximately 100 days. Invariably the animals are stalled and handfed rice straw and native grass or hay, supplemented with about 2 kg of concentrate per day. On a few farms, corn silage or silage and hay from improved pastures is fed. The fattening farms are usually large by Korean standards and have considerable resources in terms of upland and cropland; they are generally located adjacent to cities. The number of animals fed in a lot usually varies between three to seven head and three to four lots are bought and sold annually. Native Korean cattle are hardy animals but have a slow growth rate and a low fertility level of approximately 50%. When crossed with Friesian or Hereford, the first generation's growth rate is increased by 30%. Low fertility is probably a result of poor feeding rations and inadequate management.

Dairy Farming

3. The number of dairy cattle increased from 1,332 to 13,760 in the period 1961-69. This increase was due mainly to importation of some 8,200 head from a number of countries. Early in 1970, 110 weanling heifers were

imported from New Zealand for the Korea/New Zealand dairy farm, a demonstration project sponsored by the Government of New Zealand and administered by the Korea Dairy Foods Company (KDFC). Importation policy was successful and cattle from all sources had little difficulty in adapting to the Korean environment.

4. The dairy farming pattern emerging is one of small farms. The average size of dairy herd is about six head, including replacements. Twenty-seven percent of farms have one head and only 28% have a herd size in excess of 11. However, farmers with herds of 11 or more account for 40% of the total dairy cattle population. Dairy farms are generally located around the main cities, Seoul and Pusan, but urban growth is forcing the relocation of the industry.

5. Nearly all dairy farm operations are manual, including milking. Labor requirements are high and a good estimate is one workman per five cows, for milking, feeding, feed procurement and management. Capital investment in housing, silos and storage accommodation is fairly high. Farms are generally understocked and, on most farms, the stocking rate is approximately 2 ha per cow equivalent. Corn or grass silage provides the winter forage, and green soilage is fed in the summer period. Grazing is of minor importance and most farmers do not graze.

6. A major criticism of present production methods is that large quantities of concentrates are fed, estimated at 3,000 to 4,000 kg per cow per annum. The farmer pays 22 Won per kg for dairy ration and receives 50 Won per kg for milk. This price ratio encourages excessive feeding of concentrates and has encouraged the development of dairy herds on farms with little potential for forage production. There is considerable scope for improving the efficiency of dairy and beef production in Korea by increasing reliance on grass and forage and by reducing substantially the quantity of concentrates used. Much improvement in the efficiency of forage and grass production, management and storage could also be achieved. The introduction of different management systems based on yard and cubicle housing with self-feed silage, coupled with mechanical milking and forage harvesting, could improve labor productivity, particularly on the larger units.

7. An encouraging feature of Korea livestock farming is the high level of stockmanship. Farmers take good care of their animals and on a number of farms cows are milked three times daily. Two main livestock problems are evident: breeding, which generally may be attributed to poor artificial insemination (AI) service, and mastitis. Farmers have little knowledge of the disease and lack information on modern methods to prevent and control it.

B. Framework for Livestock Development

Land Resource Potential

8. General. Korea has approximately 9.9 million ha of land, 23% of which is used to produce rice or cultivated crops. A summary of land use is shown in the following tabulation.

	Million ha
Paddy fields (irrigated or rainfed)	1.3
Dry fields (upland crops)	1.0
Forest (most mountainous)	6.7
Other	0.9
Total	9.9

All valley land, whether irrigated or not, is occupied by paddy fields, which, in the narrow sloping valleys between the foothills, are carefully terraced. On the broadside of the ridges, where the slope is gentle, there are upland crop fields and village compounds. Farther up the hills and on steeper slopes, crops give way to woodlands of sparse pine. Suitable land for pasture development is in the zone where cropland changes to woodland on slopes of less than 35^{o}. These substantial untapped land resources could be profitably developed for cattle production. The following land use classification is proposed as a basis for developing that potential.

	Category	Area (ha)	Present State of Knowledge
A.	Unimproved upland, native grasses covered with sparse scrub	500,000	Sufficient knowledge and experience available for immediate development; production information incomplete.
B.	Upland, currently cropped; better utilized for pasture and forage	100,000	Sufficient knowledge and experience available for immediate development.
C.	Rainfed paddy fields, better utilized for pasture and forage	100,000	Sufficient knowledge available for immediate development.
D.	Paddy fields with potential for double-cropping hay, silage or soilage	700,000	No information available on possible yields.
E.	Woodland or rangeland suitable for surface regeneration	1,000,000	No information available on development.

9. Category A represents 500,000 ha with slope of less than 35°. It includes 40,000 ha of unimproved grassland with a good potential for livestock production in Cheju Island (paras 16 to 19). The proposed Project is aimed primarily at establishing livestock farming on this type of land. A stocking rate of one cow equivalent per 3/4 ha should be attainable.

10. Category B represents approximately 100,000 ha characterized by extremely low organic matter level, poor texture and contour, which makes cultivation difficult and results in crop yields about 30% below average.

11. Category C includes an estimated 100,000 ha of rainfed paddy out of a total paddy area of 1.3 million ha. It is uneconomic to irrigate land in this category and rice yields are low.

12. Only 46% of the 1.3 million ha in rice paddy is double-cropped. Category D, representing some 700,000 ha, may have such a potential. Hay could be harvested during May when weather conditions are good and in sufficient time to permit rice planting in June. Drainage is the major restriction on double-cropping, particularly in the southern half where the growing season permits barley harvesting before rice planting.

13. Category E includes an estimated 1 million ha out of a total of 6.7 million ha of woodland that could be developed as rangeland for summer grazing. The contour is too steep for developing re-seeded pasture, but production from native sward could be increased many times over by surface application of lime and fertilizer and by oversowing with a suitable legume. With low cost improvement, this category could possibly sustain a stocking rate of one cow equivalent per 2 ha over the summer grazing period (five to six months).

14. Three distinctive types of farming enterprise could develop on the basis of this land use classification, and future exploitation of Korean land resources will depend on the successful demonstration of feasibility:

(a) Type 1 - Livestock production farms based on grass and forage production, with a farming system similar to that set out in the proposed Project. This pattern would develop on land use categories A, B and C;

(b) Type 2 - Intensive dairy or beef producing farms based on the feed-lot system. Second-crop hay from paddy fields would provide the forage, which would be supplemented with purchased concentrates; and

(c) Type 3 - Beef breeding farms on rangeland. Breeding cows could graze while suckling for a period of five to six months. The calf crop would be fattened on type 2 farms.

15. No particular structural or social problems are envisaged in the development of farming patterns based on type 1 farms as most of the farmland would be owner-occupied. However, this would not be the case if feed-lot-type farming is to develop. Under this system, a number of farmers would have to work together to supply paddy hay, making it necessary to develop a suitable organizational structure - cooperative or otherwise. Likewise for type 3 farming, since rangeland is usually owned by a number of farmers with grazing and other rights, it would be necessary to submerge individual interests in a cooperative or some other structure before land could be developed for summer grazing.

16. Cheju Island. Cheju Island is situated 50 miles off the south coast of Korea between the East China Sea and the Yellow Sea. It is a volcanic island, oval in shape and rising gradually from a fairly flat coastal area to 400 m and then quickly to Mt. Hallah, a volcanic cone 1,950 m high. Out of a total area of 180,000 ha, 500,000, located in a band round the coast, are cropped. This cropland merges into native unimproved grassland, and an estimated 40,000 ha, located between the coastal cropland belt and the steep slopes of Mt. Hallah, are available for immediate development.

17. Cheju is by far the most favored location for pasture-based livestock farming in Korea. The climate is favorable, rainfall varies from 30 in on the west coast to 70 in on the east, with approximately 10 snow days per year. Although experience in pasture production and livestock farming, based on mixed pasture is limited, there is convincing evidence, both on Cheju research station and Isadore Association Development farm, that high producing pastures could be cheaply established. There is a good potential for either dairy or beef farms, based on an eight- to nine-month grazing season, with silage providing the winter feed. Since development of grass-based livestock farming is only now beginning, it is possible to establish farms sufficiently large for economic viability. Immediate constraints to the development of livestock farming on Cheju include scarcity of breeding stock; poor water supplies; insufficient electricity supply; insufficient capital for farm machinery, buildings and roads; and insufficient working capital.

18. The Isadore Development Association, in cooperation with the provincial government, plans to develop 65 farms per year, approximately 10 ha in area and mainly for mixed farming, including livestock production from grassland. To date, 295 farms have been settled, including 65 in 1969. Isadore Association also provides technical guidance in pasture establishment, management and animal production techniques. In addition, training courses are given to farmers in pasture and crop production, animal production techniques and machinery use and maintenance. The Association owns and operates a large farm on which sheep and beef production from grass is emphasized; it also runs a 1,500-pig unit.

19. The development of livestock farming in Cheju Island, particularly of beef production on pastures, could provide the base for a future Bank Group-financed project.

Generation of Technical Information Under the Project

20. At present, available information permits the development of only a fraction of Korea's land resources potentially suited for livestock production (paras 8 to 13). The full realization of this potential depends upon the generation of simple input-output data, which is indispensable to base investment decisions. The development of such information has been established as an important objective of the Project. To that effect, one of the prime functions of the technical services would be, in addition to assisting Project farmers, to provide overall research support on livestock production. The detailed investigational work to be accomplished by the Project's technical services is set out in the Terms of Reference for Management and Technical Services (Annex 10).

Organization and Facilities for Investigational Work

21. The Korea/New Zealand dairy farm at Pyongtaek (para 3) has the necessary facilities in terms of land (about 220 ha), buildings, dairy stock, equipment and land resources to support required investigational work under the Project. In addition, it is administered by the KDBC, administering agency for the Project. It would, therefore, be necessary for that agency to explore the possibility of drawing up an agreement with the New Zealand Government making these facilities available. Preliminary discussions with a New Zealand Government representative in Korea indicate that such an arrangement may be worked out.

22. It would be desirable for Project technical experts to work in close cooperation with the UNDP/FAO Uplands Watershed Management Project in Korea on pilot investigations on the yield of hay from rice paddy double-cropped and on the development of rangeland. The objective would be to achieve integrated development of all agricultural resources within a watershed area, working from the baseline of efficient water utilization. Three watersheds located in representative areas, comprising a total of 273,000 ha, are being developed and a project manager, employed by FAO, is assigned to each (Map). The mission discussed these aspects with the FAO representative in Korea and is confident of full cooperation. The objective would thus be to develop 50 ha of second-crop hay and 100 ha of rangeland in each of the three watershed areas. The Government would provide the necessary financing. The feasibility of establishing a farmer cooperative to utilize rangeland by grazing and a feedlot to utilize paddy hay should also be explored. Alternatively, individual farmers producing hay should be supplied with working capital to purchase stock and provide buildings to use the feed.

Integration and Coordination with Ministry of Agriculture

23. It is essential that technical assistance be linked as closely as possible with existing governmental services to ensure the greatest possible use of expertise provided under the Project and to exert maximum influence on future development of livestock farming in Korea. It can be achieved by establishing the following work arrangement with Government. The Ministry of Agriculture and Forestry would undertake research in cooperation with KDBC on important aspects of the Project and on problems whose solutions are essential to future development of livestock farming. For example, suitable research projects would include response to incremental levels of concentrate feeding for different categories of stock, yield of second-crop paddy hay on a regional basis and carrying capacity of improved rangeland. The technical staff of KDBC would review and approve the research project, including methodology used and duration, and would be entitled to inspect and supervise to ensure that execution of the project is up to the required standard. This approach is aimed at utilizing available expertise and facilities to the fullest possible extent and would give guidance to investigational work by establishing research priorities.

C. Import of Dairy Foundation Stock

24. Importations of dairy foundation stock to Korea have been confined almost entirely to in-calf heifers. Farmers are anxious to purchase heifers close to calving to generate income from milk sales in the shortest possible time. This consideration was important in earlier importation decisions. There are, however, worthwhile advantages in changing dairy cattle import policies to favor importing heifers at approximately 500-lb weight, 8 to 10 months old, and not mated, as proposed under the Project. These cattle would be mated in Korea and would calve down at approximately two years of age at weights approximating 1,000 lb before calving.

25. Transport charges account for approximately 60% to 70% of the total cost of importing stock. In general terms, two 500-lb heifers can be transported for the same cost as one 1,000-lb in-calf heifer. Since the purpose of the importation exercise is to introduce foundation breeding stock, the greatest number would be imported by transporting at the lightest possible weight. This is still true when female calves imported in foetal stage are included in calculations. In addition, when in-calf heifers or yearling heifers are considered in the herd projection model on a ratio of 5 to 7, respectively, there is a two-year lag in herd projection based on in-calf heifers reaching the same number of milking cows. Furthermore, the total number of animals sold for slaughter or fattening would be higher for a yearling model, while the financial rate of return is similar. This indicates a considerable economic advantage in favor of importing heifers, not mated, at approximately 500-lb liveweight. Finally, heifers imported at the 400- to-500-lb liveweight stage will be exposed to less risk in transport than would pregnant stock, and young stock have a better opportunity of building up disease resistance and becoming adjusted to the new environment. Importation at this stage also permits better Project planning and coordination.

26. Selection of stock is an important aspect in importing dairy cattle and a number of countries are in a position to supply suitable Friesian heifers. The Credit would finance the importation of high-grade Holstein/Friesian stock, contrary to the usual practice in Korea of importing pedigree stock. Apart from price considerations, there is much more selection possible when commercial stock rather than pedigreed are considered. Heifers should be selected from bulls with a high AI rating in the national or regional animal breeding program. A minimal dam yield should also be specified when possible, the level of yield depending on the feeding and management conditions existing in the country of origin.

27. The Technical Director for Dairy Husbandry would have full responsibility for planning and supervising livestock importations. In addition, he would work out an efficient procedure for selection, assembly and purchase of livestock in the supplying country. Usually this can be done by employing a reputable stock agent or organization. The prospect of future business should be a strong incentive to such representatives to complete the work efficiently

and at a reasonable cost. The agreement should contain a clause by which the purchaser can suspend all further purchases if a consignment is not up to standard or if delivery is not made within a specified time period. An alternative arrangement is to appoint an experienced individual within the supplying country to select and purchase stock and use a stock agent to supply all services, including payment for stock, assembly and export. It may be possible in some countries to have a government or semi-government specialist assigned to this work. The Dairy Husbandry Specialist would have authority to travel to the supply country to ensure that all aspects of selection, purchase and supply are properly handled.

28. Before cattle would leave the country of origin, adequate preparations would be required to ensure proper care and maintenance on their arrival. Farmers participating in the Project would sign agreements that they would take stock and the Dairy Husbandry Specialist would ensure that each had the necessary feed and housing facilities and had been instructed on feeding, management and routine health control measures. He would also have responsibility for ensuring that necessary quarantine facilities, including accommodation, feeding and veterinary staff, would be available to handle each consignment. Furthermore, he would ensure that there was an adequate organization for handling and transporting cattle and for providing extension service. A high-ranking government official should be named at this stage to see that all government departments and agencies cooperate fully in executing the importation.

D. Breeding Policy

29. Friesian cattle can adapt without difficulty to the Korean environment and the decision to base the development of dairying on this breed is sound. Furthermore, the Friesian is an excellent dual-purpose animal and can serve as the base for developing efficient beef production. The male calves from the national dairy herd would fill an immediate gap in the supply of suitable cattle for feeding on specialized beef fattening farms.

30. Native Korean cattle must provide the foundation stock for the development of beef farming in the foreseeable future. It is suggested that such cattle be crossed with Friesian to provide a breeding cow suitable for single or double suckling. This crossbreed could then be bred to a Hereford to provide a good beef animal. Although a small number of Zebu and Brahman have been imported, it appears unnecessary to complicate breeding or production by developing a multiplicity of breeds.

31. The development of an efficient AI service is basic to the development of livestock farming in Korea, both for dairy and beef. Korea should adopt a policy of emphasizing import of dairy and beef semen from proven bulls rather than one of importing breeding bulls. Importation of semen should be restricted to countries or regions with an efficient breeding program based on progeny and performance testing and only from bulls with a high rating in the testing program of the exporting country. Adoption of this breeding policy will enable Korea to avoid incurring the expense of developing a national breeding scheme, including herd testing and bull studs. This means that Korea should import dairy female foundation breeding stock and semen.

32. There is need to improve the AI service to fulfill its important role in the Project and in general livestock improvement. It is recommended that Korea contract with a foreign country or animal breeding service for the purpose of high quality semen and include, as a provision, that the supplying organization provide technical assistance for development of an efficient AI service in Korea. It is further suggested that KDBC undertake importation of semen and provide an efficient AI service to farmers participating in the Project.

33. The possibility of technical assistance for AI development from bilateral aid sources should be investigated. For example, New Zealand could be approached on this basis and might provide assistance for an AI service located at Pyongtaek (Korea-New Zealand dairy farm). The components needing attention in technical assistance include semen storage and diluents, use of frozen semen techniques, training of AI technicians and establishment of a check procedure on technician performance in the field. It would also be necessary to study the most efficient method of providing AI service on a national basis.

October 20, 1970

KOREA

INTEGRATED DAIRY-BEEF DEVELOPMENT PROJECT

Dairy Products Processing

A. Introduction

1. The dairy products processing component of the Project aims at establishing a profitable business by providing products of high and consistent quality at moderate cost, thereby raising the status of milk as a quality food. This may be done by adopting incentive payment schemes for higher quality milk; improving laboratory control of milk and products and their formulation; utilizing automatic machinery where warranted, along with appropriate techniques for reducing heavy work; and operating shifts where practicable. Attention should be given to reducing the cost and improving the utility and appearance of packaging, in the case of milk bottles, by a new bottle design and aluminum capping system. Distribution of market milk should be improved by the use of refrigerated stores, conveniently placed to keep vendors' delivery distances short, and by suitable thermal protection of vendors' bicycles.

2. Milk production would be developed in two districts: Central and Honam. In the Central District, a collecting and cooling station is planned where milk would be received, graded and cooled, and tankered to a bottling plant to be constructed near Seoul; surplus milk would go to the proposed Kwangju plant. Distribution facilities in Seoul would be provided for. In the Honam District, milk reception and processing would be combined in or near Kwangju city, and the major initial processing facility would be for powdered infant milk formula. A bottled milk plant with distribution facilities would be provided for later in the Project and other minor facilities in both districts.

3. Capacities and types of plant and the schedule of installation, are based on planned Project milk flows, market requirements, and the assessed operating and maintenance abilities of Korean factory workers and tradesmen. They give weight to the recommendations of the Overseas Technical Corporation Agency of the Government of Japan (OTCA), which assisted the Agriculture and Fishery Development Corporation (AFDC) in Project preparation.

4. In view of the complexity of the plants and the collection systems, depending in part on decisions that cannot yet be made on siting, farm selection and the like, further detailed design work is essential, and the following provides only a frame of reference. General Japanese practice will be a useful guide in developing the plans, but, as will be seen, a number of divergences are recommended.

5. Generally, the factory equipment list put forward by AFDC in the initial preparation had considerable duplication of individual machines to allow operating continuity, especially in the Honam plant. It is recommended, however, that factories have fewer pieces of highly reliable equipment. This occasions little capital cost change and reduces operating cost.

B. Milk Processing Capacity and Product Demand in the Project Areas

6. At first it would appear that there was already enough milk processing capacity in the country as a whole to handle all the milk produced now, with factories working less than eight hours per day. However, many are small and inefficient and they are badly distributed.

7. In the Seoul area, which represents the major pasteurized bottled milk market, the dairy industry is quite well developed. It will, however, be essential to construct new major bottled milk processing facilities there by about 1973 because the transport of bottled milk over even moderate distances is costly. Until this time, existing plants, by working extended hours and with minor plant additions, should be able to satisfy the demand. There would also be sufficient milk available, assuming some is transferred from existing drying plants to the fluid plants. There should be no difficulty in marketing the milk produced in the early stages of the projected plant operation, and it has been arranged that milk supply will increase steadily and fairly rapidly in a manner that should facilitate the marketing as well as make for good plant efficiency. In 1973-74, there should still be plenty of excess dried milk capacity in the Seoul and nearby Chonan area, conveniently placed to handle any unexpected surplus. After 1973, surplus (drying) capacity will be available in the Project's Honam plant.

8. In Honam District, the dairy industry is little developed; facilities comprise only a few small bottling plants and a miniscule condensed milk plant. It is impossible to contemplate the further development of the dairy industry in this area without providing appropriate processing facilities. These would take the form first of a drying plant, its major immediate product to be dried baby milk formulas. This plant would help satisfy the demand for an important product and at the same time provide much needed adequately sized balancing facilities for market milk production in the area over the long term. Because milk powders have good storage life, no problem is seen in their marketing or distribution.

9. Normal growth of present bottled milk demand in the District should be satisfied until about 1976 by existing production and processing capacity. Explosive growth rates could occur, however, with advertising and/or distribution to nearby cities currently without supplies, and bottled milk could ultimately be the major demand. While it would, therefore, seem necessary to provide for another plant, as recommended by AFDC, and especially since the present major one is badly sited in the city center, the equipping and commissioning of such a facility should not be done until the major one has settled down. Other facilities provided for include a small butter unit to balance low-fat powder production and provide some local needs, and a small condensed milk plant to meet an existing demand and market product-line needs. The plant would also be able to utilize most types of second grade milk.

C. Milk Collection

10. Because Korea generally has good low-temperature water supplies, the farmer would water-cool his milk on the farm to about 16°C or less. At such temperatures, deterioration of reasonably hygienically produced milk is slow, allowing a flexibility in collection timing, including once-daily collection. The farmer would accordingly deliver the cooled milk in cans, either directly to the factory (for a higher payment) or to the roadside once daily at a prearranged time for factory-truck collection. The cans from the previous collection would be returned at the same time. Simple shelters are needed to keep the sun off the cans at the roadside and several farmers can use the same one.

11. On a few larger farms with good access, collection may be made at the farm, and provision has been made for collection at a later stage by milk tanker pumping out of cans at roadside. In this case, simple senses/rejection tests would be done and samples taken for analysis before the milk is picked up. Second grade milk would be handled separately, possibly in cans carried on racks at the side of the tanker.

12. Farms would be selected, not only for their topographical and managerial suitability, but also on the basis of access, grouping (nearness to other dairy farms in the collection area) and water supply. The latter considerations are essential to maintain good milk quality without excessive costs in cooling facilities and/or transport.

D. Central District

Collecting and Cooling Station

13. All milk from the area would be received, filtered and cooled at this station, and farmers' milk payments would be made from it. The laboratory would check incoming milk quality and provide services to the farm field staff. Initial collection would be by 2,000-kg flat-deck trucks, and provision has been made for future pickup from cans at roadside or farm using a tanker-mounted milk meter. Initially one, and the next year two, 10,000-liter milk tankers would be based at the collection station for deliveries to Seoul or Kwangju. Provision is also made for a tanker trailer when needed.

14. The major machinery would consist of a roller-conveyor for can handling, a 360-can/hr rotary canwasher, milk scales and receiving vats to permit separation to two grades of milk, the second grade use depending on the defects. The cooler would be plate type and a 6,000-liter/hr milk throughput, arranged to water-cool the milk to within 2°C of the water temperature and to 4°C with chillwater. The 10,000-liter agitated insulated storage tanks, with provision for a third, are allowed for, as well as twin 10-ton freon or other automatic refrigeration units. There would be space for three, along with an icebank tank to reduce peak power loading. Units are sized to cool the milk to 10°C, the maximum safe long-distance transport temperature, on a single unit in an emergency. Provision has also been made for a hot water boiler, oil-fired, with a capacity of 0.8 x 10^{0} BTU/hr. No steam is needed in this plant, but the canwasher will require special ordering. No standby is necessary for this plant. There will be a car and a motorcycle provided for general use.

Seoul Plant

15. All milk is to be received cold by tanker at the Seoul plant, where only first grade milk would be homogenized, pasteurized and bottled. Distribution would be made from the plant and vendors accounts would be handled there. The laboratory would control product composition and quality and do necessary investigational and product development work. Adequate allowance has been made for a very high standard of construction and site development and for groups of visitors within the plant.

16. The initial principal machinery installation would consist of high-class automatic crate handling and decrating equipment; bottlewashing, filling and capping equipment; automatic recrating equipment, all for 12,000, 180-cc bottles per hour. Milk equipment includes two 10,000-liter and one 5,000-liter insulated agitated receiving/storage tanks with provision for four, a 3,000-liter/hr standardizing separator/clarifier; a 3,000 liter/hr homogenizer; a high-temperature, short-time HTST plate pasteurizer with automatic flow diversion and such, also plated for at least 85% regenerative cooling, followed by chillwater cooling to 4°C; and suitable intermediate storage vats, pumps, and the like. Initially, the pasteurizer should be derated to more nearly match the bottling line.

17. In the second operating year, a second bottling line, with manual crate and bottle handling, and a capacity of 3,000/hr would be added. There would also be three 720-liter batch pasteurizer/mixing vats, along with an 1,800-liter/hr clarifier, homogenizer and plate cooler, and suitable storage. This would be a multipurpose line that could be used batch-wise for flavored milks, or with the No. 1 line pasteurizing equipment at full capacity, for increasing ordinary bottled milk capacity.

18. In the third year, provision is made for a 500-liter/hr ice-cream plant of standard type, with batch pasteurizers.

19. Refrigeration equipment would include three 10-ton units, initially for chillwater supply, with an additional 30-ton unit for the ice-cream plant in the third year. The milk and ice-cream storage rooms have independent freon units, and provision has been made for some air cooling in restricted areas (such as those for visitors). The boiler has a 2,000-kg/hr streaming capacity (a hot-water boiler is a preferred alternative) and is oil-fired; provision is made for a standby unit in project year-3. A car and a motorcycle would be provided for general use and there would be a distribution truck.

Distribution System

20. Milk would be distributed from the factory coolroom directly to some vendors and from conveniently located refrigerated stores to others. Distribution to the stores and large users would be by two 6-ton and one 2-ton insulated trucks; one 6-ton and one 2-ton would be scheduled for the first year and the second 6-ton unit the second. One 2-ton flat-deck truck is scheduled for each of the first two years for bottle collection and the like.

21. The stores provided for would be of prefabricated construction with aluminum skin and lining and suitably protected; interior size would be 7 x 4 x 2-1/2 m high with 10-hp freon units. A loading dock, office and facilities would be attached and each run by one man. Two would be provided for project year-1 and one for project year-2. The structures themselves and the surroundings would be chosen with promotion in mind. No provision has been made for refrigerated ice-cream transport. Although independent vendors would handle the milk from the stores, it could be in the interest of the Korea Dairy Beef Company (KDBC) to provide them with suitable uniform clothing and delivery bicycles, so fitted as to provide display space and insulation for the milk crates.

E. Honam District

22. All milk from the area would be received, tested, cooled and processed at this plant. It would also act as a balancing station for surplus milk from the Central District and for processing some types of second grade milk. All routine transactions with the farmers would be made here, and, later, financial transactions with milk vendors.

23. Initial provision would be for milk can reception and for a 10,000-kg/hr cooler and a clarifier. There would also be 10,000-liter insulated agitated storage/reception tanks. The initial processing facility would require equipment for producing dried milk; this would include a standardizing separator with a maximum capacity of 4,000-liters/hr, batching vats for mixing/standardizing, and heat treatment equipment combined with the evaporator to permit heat treatments up to those required for high heat skim milk powder. The evaporator would be the continuous falling film type, with double effect and vapor recompression, and an evaporative capacity of 2,200 kg/hr. The drier would have an evaporative capacity of 450 kg/hr.

24. Because it would be desirable to make a number of different products, a good measure of flexibility would be essential to control temperature, pumping rates, and so on. This plant should balance at about 45% solids from the evaporator at 3,000-kg/hr input on unmodified whole milk. The types of drier that should be considered most seriously are the horizontal type with pressure jet atomization and the squat vertical type with disc atomization, both of which are suited to small-scale operation and sufficiently flexible. A steam air heater would also be provided. Appropriate pneumatic powder conveying systems and 4-by-4-ton powder batching bins are included, along with appropriate precautions for handling low moisture (2%) powders. There would be blending equipment for dry mix powders and filling systems for 1-kg bags and 500-g gas packed cans (1,500 cans/hr).

25. Refrigeration equipment provided for would include initially two 30-ton units for chillwater, with appropriate storage, plus a third similar unit for bottled milk later. These capacities assume water precooling of milk in all cases. Coolrooms would have independent freon units, and allowance has been made for some local air cooling, again by independent units. Initially, one 4,000-kg/hr 250-psi oil-fired package-type steam boiler would be provided, followed by a standby unit in project year-2. A centralized electrical switchroom would have local motor controls.

26. A bottled pasteurized milk facility would be provided about the third year. This would include a 1,500-liter/hr HTST plate pasteurizer with automatic flow diversion and at least 85% regenerative cooling, and a

1,500-liter/hr homogenizer. Two 720-liter batch pasteurizers and a 1,500-liter/hr clarifier would produce flavored milks and such. The single bottling line would provide for manual crate handling, decrating and the like, and 6,000-bottle/hr automatic washing, filling and capping machinery for 180-cc bottles. There would also be a small butter unit featuring a stainless steel batch churn with a capacity of 300 kg butter/batch and semi-manual packing. An evaporated milk/sweetened condensed milk plant, utilizing a 5,400-liter batch pan and appropriate can handling (397-g) and filling equipment would be included. The milk butter and condensed milk facilities would be separately housed. A car and a motorcycle would be provided for general use.

27. A distribution system similar to that described for Seoul (para 20) would be set up for the bottled milk installation. In this case, only one distribution station is scheduled and one 6-ton insulated truck. Distribution of powder and canned products would be directly from the plant warehouse and butter from the butter chillroom. The refrigerated truck needed for the ice-cream plant at Seoul might also be used for butter transport in due time.

F. Detail Planning of Factory Facilities and Technical Assistance

Design

28. Preliminary planning for the Project by OTCA in Japan was excellent for estimation purposes but there are many modifications necessary to meet changes in the proposals, specific problems, and capacity alterations, and to make provision for expansion, as well as to solve the inevitable problems that will emerge when sites are chosen. Consequently, details must be worked out and some consulting service would be needed. No suitable consultant with experience in this field is available in Korea, but AFDC has good general engineering planning facilities and some Korean individuals, currently employed in dairy factory management, would be of great value.

29. To provide the Korean input, it is recommended that a high technical official in the planned staff for KDBC, possibly the Technical Director or someone near him, be recruited as soon as possible, to work with the AFDC engineers and the consultants in planning the factories and the associated utilities and in preparation of specifications. It is important that he should also have responsibilities for the operation of the plants later and the authority to act on the planning, construction and later development as needed.

30. The external consultancy would do its work in Korea to assist in building up local expertise. This would be easiest to organize if two experts on dairy processing could be made available to KDBC/AFDC by way of an aid program. In such a case, it may be possible to enlist further OTCA assistance, which would be most valuable.

31. The fastest possible start on planning following granting of the loan is essential because only two years are available before the first plant must be in operation. If possible, preliminary planning; site selection, at least to the taking of options to purchase; and investigation of the availability of building contractors and such should be done by AFDC and precede the hiring of consultants.

Plant Startup and Operation

32. For plant operation, it should be possible to recruit some Koreans with experience, since the dairy industry has been operating there for some years and the staggered start of major facilities allows for KDBC staff training. If the aid scheme suggested for consultants can be organized, effort should be made to have some extra experts available for plant startup, and, in any case, the equipment suppliers would have staff on hand. It is important that provision for this be made in quotations for plants and in ordering.

33. If international consultants are to be used, they should be able to give assistance during the startup period. In either case, a key person will be the Korean(s) appointed for the planning phase. With the phasing of construction of the plants recommended and the development of expertise by the Koreans involved, both in design and plant operation, it should be possible for the consultants to complete their work with the startup of the drying plant at Kwangju and leave later developments to the KDBC staff.

G. Timing and Construction

34. Because of lack of bottled milk processing capacity in Seoul, it is important to have the Seoul plant operating by first milk flow from the Project. Consequently, the main facilities in the Central District should all be planned and their construction coordinated to ensure this.

35. There would be no milk available until the following year in Honam, allowing for more time for planning and construction. It is, however, important to have the drying plant operating by the fourth year, as it provides for surplus milk from the Central District and the milk from the Project in Honam District could not be processed anywhere else, nor cooled for distance transport, since there is no suitably large facility. In the fifth year, a standby boiler facility is scheduled for Honam and the ice-cream plant for the Central District. The latter needs to be available for the summer season.

H. General Technical Processing and Product Quality Considerations

Milk Quality

36. Present quality standards for milk as received at the plants leave much to be desired. They are of a simple acceptance/rejection type for content (30% min) based on hygiene quality and composition, including flavor and smell (senses), an alcohol test (68%) and specific gravity (1.028 to 1.034). The hygiene standards, while they could be improved, are of less concern, however, than the composition standards, which, in effect, set a very low level for total milk solids. They are, in fact, considerably lower than those in milk produced from average cows in Korea, in which fat content, for instance, is commonly around 3.4% to 3.5%. There is no increased payment for milk of higher solids content; consequently, the temptation to add water to the milk is great. With these standards, control is difficult and bottled milk is therefore, of low and somewhat variable solids content, which gives rise to justifiable customer dissatisfaction. More suitable standards would include, first of all, provision for incentive payments for milk of higher total solids content. This could be based on fat, protein, or solids not fat (SNF). The Japanese system is based on fat content and provides for a basic payment of 50.96 Won/kg at 3.2% fat. Each 0.1% fat above this to 3.8% brings an additional 0.9 Won/kg and each 0.1% fat less, a deduction of 0.8% Won/kg, with rejection for town milk at 3.0% fat. Such milk would presumably then be used for manufacturing, at 30 to 40 Won/kg. In addition, milk under 8.0% SNF is paid for only at 25.43 Won/kg. Similar systems are used in other countries and are well documented.

37. The Milko meter provides the cheapest way to test accurately the numbers of samples required for fat. This test costs about US$0.03 equivalent per sample. The more familiar Babcock Test costs about US$0.12 equivalent per sample. Automated dye binding methods for protein cost about US$0.08 per sample, standard yeldahl tests rather more. Direct weighing tests for SNF cost about US$0.04 equivalent per sample. Although protein is probably a more satisfying basis for test, it is suggested that the payment scheme be set up on a fat basis and that basic payment be made on 3.2% fat with 1.5 Won/kg per 0.1 fat above and below this, no milk being used for bottling that tests below 3.2%. In Korea approximately 1.5 Won/kg would be the appropriate incentive at a standard 3.2% fat milk value of 50 Won/kg. This should be supplemented by a reject test on SNF with a minimum of 8% and a substantial penalty for lower levels, say minus 25 Won/kg. Testing should be done on a spot-check basis, approximately weekly, for each supplier rather than on composite samples; this system is used in England and Ireland. Additionally, the methylene blue test is recommended for daily hygenic quality tests. This is well suited to conditions in Korea and is well documented; an appropriate time standard could be three hours for first quality milk.

38. Thus, the recommendation is that standards be established for milk as received at the factory on the following lines:

(a) Senses test daily--putrifaction, contamination, feed flavors, would downgrade;

(b) Methylene blue test daily;

(c) Fat test periodically - standard payment for, say, 3.2% fat, ± 1.5 Won/kg per ± 0.1% fat deviation; method recommended, Milko tester; standard samples for calibration to be provided by KDFC, Seoul laboratory;

(d) SNF test periodically - gravimetric, say, 25 Won/kg if below 8.0%; and

(e) Other indicative tests such as specific gravity.

39. It is further recommended that standards decided on be written into the contracts with the farmers, since Government-enforced standards do not meet the needs.

Problems in Milk Processing

40. An occasional problem is a shortage of some machinery spare parts, such as gaskets for plate heat exchangers, which may necessitate KDFC holding stocks. The significance of this is likely to be lessened by the probable forthcoming joint Japanese-Korean venture by the Japanese firm UEDA, which has supplied most dairy processing equipment to Korea and which plans to stock spare parts in Korea.

41. Problems applicable to bottled milk include the quality and design of Korean milk bottles. These vary in size and break easily, representing a rather high cost factor in production. The design of the pouring lip and cardboard capping system necessitates the use of a celophane overwrap to protect the bottletop from contamination. This is also expensive. The English bottle design with an aluminum foil cap crimped over the bottle top, so protecting the lip, is much better and the caps are substantially cheaper. These foil caps are automatically date-stamped, which is an essential quality control factor, and they give a much better appearance than cardboard caps. Cardboard caps and overwraps have been provided for in the costing, but serious consideration must be given to aluminum foil caps for the Project on account of improved hygiene and appearance and lower cost. Since AFDC is to be involved in a new glass bottle plant to be constructed, it should be possible for them to arrange for production of more suitable bottles.

42. The heat treatment commonly applied to milk in Korea, as in Japan, is far beyond that required for pasteurization, but is short of requirements for sterilizing. It imparts a definite cooled flavor to the milk and would alter its food value. If product identity is required, KDFC should contemplate reducing the heat treatment applied to more normal levels.

43. Generally, standards for market milk appear adequate. It is recommended that standardization for fat be considered.

44. From operating costs, it is noticeable that packaging for baby milk powder is very costly. It appears to be possible to utilize existing less costly methods of packing, such as foil schets, at considerable cost saving to the consumer and probably an increased market. The baby food currently available and costed in this Project has about 20% sucrose and 10% lactose. If all lactose were used, a better quality product would be produced at about 5% higher cost. This cost increase could probably be reduced or even eliminated by appropriate action on the local Korean prices for lactose, but, in any case, a slightly higher cost would probably be thought more than worthwhile by nutritionists and would fit with the KDFC plan to market quality products.

KOREA

INTEGRATED DAIRY-BEEF DEVELOPMENT PROJECT

Agriculture and Fishery Development Corporation (AFDC)

Korea Dairy Beef Co., Ltd. (KDBC)

A. AFDC

Objectives and Functions

1. AFDC was founded December 1, 1967, by the Agriculture Fishery Development Corporation Act, passed by special legislation in October 1967. It is intended to be a major force for implementation of the national policy of achieving a balanced growth of agriculture and industry by encouraging farmers and fishermen to broaden their productive activities efficiently, thereby stimulating an overall increase in rural income. In contrast with a 10% annual growth rate for the overall economy of the country, the agricultural sector has been expanding at an annual rate of only about 4%. To achieve its objective of "enhancing income levels of agricultural and fisheries communities," ADFC performs the following principal functions:

(a) financing equity investments and long-, medium- and short-term loans for the development of industries producing, storing, processing and marketing agricultural and fisheries products;

(b) encouraging domestic and foreign investments in such industries;

(c) providing technical and management assistance, and technical information and training for relevant industries;

(d) creating and developing domestic and export marketing of agricultural and fisheries products; and

(e) introducing improved institutional frameworks and carrying out other activities necessary for a smooth growth of agribusiness.

2. In carrying on its operation, AFDC exercises much greater independent judgment and decision-making power than do other government cor-

porations in this country. The broad autonomous character of AFDC is ensured by a special instruction issued by the President of the Republic of Korea on December 7, 1967, to Cabinet officials concerned. The Presidential instruction said:

(a) in view of its special character, the Agriculture and Fishery Development Corporation should develop its business basically on its own initiatives and through its autonomous activities;

(b) restrictions and controls on the AFDC should be minimized so that the AFDC can be staffed with the most competent workers and operated under creative management of its president;

(c) AFDC should be exempted from the Budget and Accounting Law Concerning Government Corporations, and, instead, be allowed to establish flexible accounting and other regulations to govern its activity and operation; and

(d) as a result of such measures as outlined above, AFDC should become a model for management and operation of state-owned enterprises.

3. The most important functions of AFDC are to develop plans for viable enterprises for storing and processing agricultural and fishery products, construct and operate physical facilities needed for such purposes, and provide for the necessary risk capital and loans needed for the successful initiation and maintenance of such enterprises.

Investments

4. AFDC has invested in 22 enterprises during the past two years. The order of priority in AFDC investment is determined by judging projects according to the following criteria and selecting those that:

(a) have sufficiently high profitability which can make effective contributions to increasing cash incomes of farmers and fishermen;

(b) can significantly increase exports or replace imports;

(c) can substantially increase employment levels;

(d) are most desirable from the viewpoint of community development; and

(e) can effectively serve the purpose of the overall national economic policy.

Investments have ranged from intensive labor production enterprise (e.g., sericulture, mushrooms, tobacco) to processing (e.g., manufacture of glucose, fruits, vegetables) and to cold storage and marketing (e.g., oranges, apples). Only five of the 22 companies have passed one year since the startup of their production facilities. About six of these, not expected to break even in 1970, are mostly in the very early stages of operation. In 1971, all existing AFDC-financed companies, except Korea Cold Storage Co., are expected to earn profits. AFDC holdings at the end of 1969 account for 100% of the capital stock in seven companies, 50% or more in 11 and less than 50% in four.

Capital Resources

5. AFDC's initial authorized capital of 5 billion Won (US$16 million) was increased to 10 billion Won (US$32 million) to strengthen its international credit rating and to make its operation more effective. By the end of 1969, the Government had paid in 5 billion Won (US$16 million) and also granted a loan of 728 million Won (US$26 million). AFDC holds slightly more than 80% or about 2.6 billion Won (US$8.5 million) of the total paid-in capital of its 22 affiliated enterprises. External borrowings (IBRD, ADB and private banks) will become an increasingly important source of funds. Earnings from marketing, both domestic and export, and interest on loans constitute its principal operating income. In 1969, AFDC realized a net profit of about 15 million Won (US$50,000), compared with a loss of a slightly smaller amount in 1968, its starting year. See financial statements given in Tables 1 and 2 for operations in 1968, 1969 and 1970 forecast.

Management

6. By virtue of its broad autonomous character (para 2) AFDC has been able to attract a qualified and competent professional staff for key administrative, financial, planning, research and technical positions. It is headed by one President, appointed by the President of the Republic; one Executive Vice-President; up to four Directors; and one Auditor. The Board of Directors is composed of the President, Vice-President and Directors. Each Director heads a main department.

7. Of particular importance to the Project would be the relationship between AFDC and KDBC, Project administering agency. AFDC would supervise the operations of KDBC within a broad policy framework, would give management training, and expect it to operate on a strictly commercial basis, maintaining an independent account of its operations in order to show how efficiently and effectively it utilizes its capital. It would also give assistance in procurement of Project goods and services, technical assistance in the planning of the proposed two dairy processing units, and do research and market promotion for its dairy products. In summary, the services and assistance that AFDC gives to its affiliated companies would enhance KDBC's capability to successfully implement the Project.

B. KDBC

History

8. KDBC was founded by AFDC in February 1969 as an affiliated enterprise to be engaged in livestock production, milk processing, and marketing. Since then, its operations principally have been the development and management of the Korea-New Zealand Dairy Demonstration Farm and preparation of the proposed project. The Korea-New Zealand dairy farm was started in 1969 under a bilateral aid program (Colombo Plan) 1/ between Korea and New Zealand for the purpose of determining whether certain New Zealand pasture and forage production practices could be applied in Korea.

Capital

9. KDBC is incorporated as a limited liability company. The full amount of share capital, entirely held by AFDC, amounts to 150 million Won (US$490,000). It would be further capitalized by AFDC (funds may be obtained from Government) by about US$1.3 million equivalent. This would be used for the planning and development of two dairy products processing facilities (about US$0.5 million), project management and technical services (about US$0.5 million) and working capital (about US$0.3 million). Since KDBC's present authorized capital is only 150 million Won, it would be necessary for it to be increased to about 600 million Won (about US$2 million equivalent). In effect, AFDC's investment would be equity capital for which no fixed rate of dividend is stipulated. If any additional working capital would be needed, AFDC would advance it to KDBC at 18% per annum. KDBC's financial statements for 1969 and estimated for 1970 are shown in Tables 3 and 4.

Organization

10. At the time of appraisal, organization of KDBC was fairly simple. It consisted of about 15 employees, ranking from the President (General Manager) to a tractor driver. To administer the Project, KDBC's staff would need to be expanded to about 25 professional personnel and departments organized. Qualified Koreans would be available. The Mission discussed with KDBC an organization plan, as well as staffing requirements, and agreed to an organization similar to that shown in Annex 9. Basically, KDBC would be organized in five major departments: Administration, Technical Services, Dairy Processing, Marketing, Finance. Each would be headed by a Korean under the administration of a president and executive vice-president. Key departments for execution of the Project would be Technical Services and Dairy Processing.

1/ New Zealand's contribution consists of limited technical assistance (farm manager and a crop specialist), some agricultural machinery and 110 Freisen heifers and 9 bulls.

11. In addition to the Heads of Technical Services and Dairy Processing Departments, there would be two Technical Directors--Dairy Husbandry and Dairy Processing, the latter possibly a consultant service. Other technical assistance would include a specialist in agronomy, one in animal nutrition and about 10 specialists in livestock production (see Annex 10 for terms of reference).

KOREA

INTEGRATED DAIRY-BEEF DEVELOPMENT PROJECT

Condensed Balance Sheet, AFDC
(Won billion)

	12/31/70[1]	1969	1968
ASSETS			
Current Assets	4,505	2,295	1,147
Cash	156	241	433
Receivable-trade	175	38	-
Commodities	-	70	-
Short-term credits to subsidiaries	3,620	1,498	570
Short-term credits	179	13	14
Prepayments	-	111	-
Suspense payments	-	99	-
Payment guarantees	31	41	33
Account income	-	117	12
Account under construction	35	18	84
Other assets	309	49	1
Fixed Assets	6,663	3,697	1,904
Physical assets	290	42	324
Intangible assets	83	83	92
Investments	6,290	3,572	1,488
Deferred Accounts	61	41	11
TOTAL ASSETS	11,229	6,033	3,062

	12/31/70[1]	1969	1968
LIABILITIES AND CAPITAL			
Current Liabilities	25	123	83
Fixed Liabilities	4,603	919	4
Long-term borrowings	4,583	905	4
Reserve for retirements	20	14	-
TOTAL LIABILITIES	4,628	1,042	87
Paid-in Capital[2]	6,500	5,000	3,000
Capital Surplus	1	1	-
Net Profit (Loss)	100	(10)	(25)
Loss brought forward	15	26	11
Profit	115	16	(14)
TOTAL CAPITAL	6,601	4,991	2,975
TOTAL LIABILITIES AND CAPITAL	11,229	6,033	3,062

Source: AFDC
1) Forecast October 1 by AFDC
2) Authorized capital 10 billion won

October 20, 1970

ANNEX 3
Table 1

ANNEX 3
Table 2

KOREA

INTEGRATED DAIRY-BEEF DEVELOPMENT PROJECT

Financial Statements of AFDC
(Won million)

	12/31/70[1)]	1969	1968
Operating Revenues	1,682	806.6	333.1
Exports	676	169.7	2.4
Domestic sales	370	317.9	121.3
Commissions-export and import	35	4.5	-
Interest on lendings	548	244.1	0.4
Interest on deposits	-	70.4	209.0
Other	53	-	-
Operating Expenses	1,125	445.3	115.8
Export	584	151.7	15.1
Domestic sales	360	261.1	100.5
Interest paid	136	32.5	0.2
Other	45	-	-
Gross Profit	557	361.3	217.3
General and Admin. Expenses	347	369.6	225.0
Salaries	162	144.9	92.4
Miscellaneous	185	224.7	132.6
Special Administrative Expenses	20	17.4	7.0
Survey	-	12.2	0.5
Project development	5	2.5	0.5
Management	8	2.7	4.6
Guidance to subsidiaries & Research	7	-	1.4
Sales expenses	64	-	-
Operating Profit (Loss)	126	(25.7)	(14.7)
Non-operating Profit	-	62.3	3.9
Current Gross Profit (Loss)	126	36.6	(10.8)
Non-operating Expenses	10	21.0	3.1
Current Net Profit (Loss)	116	15.6	(13.9)

Source: AFDC
1) Forecast October 1 by AFDC

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KOREA

INTEGRATED DAIRY-BEEF DEVELOPMENT PROJECT

Balance Sheet, KDBC
(Won '000)

	12/31/70[1]	12/31/69
ASSETS		
Current Assets		
Cash on hand	44	111
Cash in bank	400	15,087
Final goods finished	-	153
Partly finished goods	-	2,758
Stores	738	2,461
Suspense payment	-	57
Calves	-	193
Grass	-	1,200
Subtotal	1,182	22,020
Fixed Assets		
Tangible		
Building	40,377	13,742
Structures	9,603	6,103
Delivery	7,642	3,342
Machinery	7,150	-
Furniture and fixtures	3,472	2,291
Land	69,889	48,674
Other facilities	871	871
Cattle	17,828	2,238
Constructions in process	-	11,719
Subtotal	156,832	88,980
Intangible-leasehold right	4,994	794
Unamortized Expenses		
Organization	607	607
Development	19,659	6,008
Subtotal	20,266	6,615
Total Assets	183,274	118,409
LIABILITIES		
Current	-	12,148
Long-term borrowings (AFDC)	18,200	10,800
Employees deposits	596	-
Total Liabilities	18,796	22,948
CAPITAL		
Issued Capital (AFDC)	150,000	100,000
Aid from Government	24,038	-
Loss brought forward	(9,560)	(4,539)
Total Capital	164,478	95,461
CAPITAL AND LIABILITIES	183,274	118,409

Source: KDBC
1) Forecast October 1 by KDBC
October 20, 1970

ANNEX 3
Table 4

KOREA

INTEGRATED DAIRY-BEEF DEVELOPMENT PROJECT

Operating Income and Expense, KDBC
(Won '000)

	1970[1]	2/14 to 12/31 1969
Net Sales	3,240	847
Cost of Sales	3,996	572
Manufacturing cost of production	19,946	725
Final inventory	15,950	153
Gross Profit from Sales	756	275
Selling, Administrative Expenses	3,384	6,005
Salaries	1,487	2,156
Travelling, communication	246	668
Office supplies	244	321
Representation	752	1,446
Repairs, maintenance	481	675
Administrative, technical services	-	709
Miscellaneous	174	30
Operating Profit (Loss)	(4,140)	(5,730)
Non-operating Revenues		2,007
Interest on deposits	600	1,815
Miscellaneous	-	192
Gross Profit (Loss)	(3,540)	(3,723)
Less interest paid	1,481	815
Net Profit (Loss) for the Period	(5,021)	(4,538)

Source: KDBC
1) Forecast October 1 by KDBC

October 20, 1970

KOREA

INTEGRATED DAIRY-BEEF DEVELOPMENT PROJECT

Dairy Farm Development Projections

Model 1: 10-Cow Dairy Farm

Investment Cost Projections

Investment Item	Unit	Average Units Per Farm	Average Unit Cost	Average Cost Per Farm	Development Phasing (Farm Year) 1	2	3	Total Cost for 600 Farms (Won '000,000)	(US$ '000)
			(Won '000)						
Pasture Establishment 1/	ha	9.5	10	95	40	15	40	57	187
Farm Structures:									
Cow Barn	unit	12	60	720	360	-	360	432	1,417
Silo and hay shed	AU	12	15	180	180	-	-	108	354
Cattle 2/	head	7	125	875	-	875	-	525	1,721
Machinery and equipment:									
Tiller and attachments 3/	set	1	340	340	340	-	-	204	669
Milking machine	unit	1	150	150	-	-	150	90	295
Milk Cans	units	12	4	48	-	-	48	29	95
Milk cooler and pump	units	1	30	30	-	-	30	18	59
Total				2,438	920	890	628	1,463	4,797

1/ In addition the Government provides a subsidy of about 62,000 Won/ha for pasture establishment in the form of fertilizer, lime, pasture seeds and foodgrains.
2/ One-year old grade Friesian heifers at a CIF cost of 390 US$/head, port of Pusan, 119,000 Won, plus quarantine and other costs equivalent to 6,000 Won/head.
3/ In addition Government provides a subsidy to the manufacturer of about 80,000 Won per tiller.

ANNEX 4
Table 1

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KOREA
INTEGRATED DAIRY-BEEF DEVELOPMENT PROJECT
Dairy Farm Development Projections

ANNEX 4
Table 2

Model 1: 10-Cow Dairy Farm
Herd Projection

CATEGORY	Unit	Value Won	Farm Year 1	2	3	4	5	6	7	8	9-11
HERD COMPOSITION[1]											
Cows	No.	180,000	-	-	7	6	7	8	8	7	8
In-calf Heifers	No.	180,000	-	7	-	3	3	2	2	3	2
Heifer Calves	No.	60,000	-	-	3	3	3	3	3	3	3
Bull Calves	No.	60,000	-	-	3	2	-	-	-	-	-
Total	No.		-	7	13	14	13	13	13	13	13
Animal Units	No.		-	7	7	9	10	10	10	10	10
BIRTHS											
Heifer Calves	No.		-	-	3	4	4	5	5	5	5
Bull Calves	No.		-	-	4	3	5	5	5	5	5
Total	No.		-	-	7	7	9	10	10	10	10
PURCHASES											
Heifers - not mated	No.	125,000	-	7	-	-	-	-	-	-	-
Total	No.		-	7	-	-	-	-	-	-	-
MORTALITY											
Cows	No.		-	-	-	-	1	-	-	1	-
Heifer Calves	No.		-	-	-	1	-	1	1	1	1
Bull Calves	No.		-	-	1	-	1	1	1	1	1
Heifers, 9-24 months	No.		-	-	-	-	-	-	1	-	1
Total	No.		-	-	1	1	2	2	3	3	3
SALES											
Cull Cows	No.	125,000	-	-	-	1	1	2	2	2	2
Cull Heifers, 9-24 months	No.	100,000	-	-	-	-	-	1	-	-	-
Bulls, 24 months	No.	140,000	-	-	-	3	2	-	-	-	-
Heifer Calves	No.	25,000	-	-	-	-	1	1	1	1	1
Bull Calves	No.	20,000	-	-	-	1	4	4	4	4	4
Total	No.		-	-	-	5	8	8	7	7	7

TECHNICAL COEFFICIENTS

Calving Interval - 14 months
Conception Rate - 88%
Culling Percentage - 18% 2/
Calving Rate - 100%

Lactation Length - 280 days
Milk Yield:
1st Lactation - 2,600 kg
Subsequent - 3,500 kg

Mortality:
Adults - 3%
Cattle 9-24 mo - 4%
Calves 0-9 mo - 20%
Age of 1st Calving - 24 mo.

1/ End of year figures.
2/ Cows not in-calf are included in culling percentage.

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KOREA

INTEGRATED DAIRY-BEEF DEVELOPMENT PROJECT

Dairy Farm Development Projections

Model 1: 10-Cow Dairy Farm

Sales, Operating Expenses, and Net Operating Income

	Unit	Price per Unit (Won)	Farm Year 1	2	3	4	5	6	7	8	9-11
			(Won '000)								
SALES											
Milk	l	50	-	-	910	1,225	1,310	1,660	1,660	1,660	1,660
Cattle		1/	-	-	-	565	510	455	355	355	355
Total			-	-	910	1,790	1,820	2,115	2,015	2,015	2,015
OPERATING EXPENSES											
Fertilizer	ha	10,000	20	50	85	115	115	115	115	115	115
Reseeding and Liming	ha	8,000	-	-	-	16	16	16	16	16	16
Corn seed 2/	ha	4,000	10	10	10	10	10	10	10	10	10
Labor	man/year	180,000	-	180	180	180	180	180	180	180	180
Feed:											
Milk cows	head/year	22,000 3/	-	-	154	154	176	220	220	198	198
Dry cows	"	15,000 4/	-	91	78	143	104	78	65	78	78
Veterinary and AI			-	21	33	44	48	48	48	48	48
Machinery Operation and Maintenance			30	70	70	70	70	70	70	70	70
Miscellaneous			-	10	10	10	10	10	10	10	10
Subtotal			60	432	620	742	729	747	734	725	725
Total 5/			65	480	680	820	800	820	810	800	810
NET OPERATING INCOME 6/			(65)	(480)	230	970	1,020	1,295	1,205	1,215	1,205

1/ See Table 2.
2/ Two sowings of 50 kg/ha each on 2.5 ha.
3/ 1,000 kg/cow/year at 22 Won/kg.
4/ 700 kg/AU/year at 22 Won/kg.
5/ Including a contingency allowance of about 10%.
6/ Before debt service

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ANNEX 4
Table 3

KOREA

INTEGRATED DAIRY-BEEF DEVELOPMENT PROJECT

Dairy Farm Development Projections

Model 1: 10-Cow Dairy Farm
Financial Projections

	Farm Year									
	1	2	3	4	5	6	7	8	9-10	11
	(Won '000)									
Cash Inflow										
Sales	-	-	910	1,790	1,820	2,115	2,015	2,015	2,015	2,015
Loan:										
Long-term	690	667	477	-	-	-	-	-	-	-
Short-term	105	728	695	-	-	-	-	-	-	-
Farmer's Contribution	230	223	151	-	-	-	-	-	-	-
Total	1,025	1,618	2,233	1,790	1,820	2,115	2,015	2,015	2,015	2,015
Cash Outflow										
Investment	920	890	628	-	-	-	-	-	-	-
Operating Expenses	65	480	680	820	800	820	810	800	810	810
Total	985	1,370	1,308	820	800	820	810	800	810	810
Annual Cash Balance Before Debt Service	40	248	925	970	1,020	1,295	1,205	1,215	1,205	1,205
Debt Service										
Long-term Debt:										
Interest (9%)	32	92	144	165						
Annuity 1/	-	-	-	-	402	402	402	402	402	-
Short-term Debt:										
Interest (15%)	8	51	53	-	-	-	-	-	-	-
Principal	-	105	728	695	-	-	-	-	-	-
Total	40	248	925	860	402	402	402	402	402	-
Annual Cash Balance After Debt Service	-	-	-	110	618	893	803	813	803	1,205

1/ For calculation purposes it is assumed that on-average long-term loans would be for 9 years including 3 years of grace and that they would be amortized on an equal semi-annual annuity plan.

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ANNEX 4
Table 4

KOREA

INTEGRATED DAIRY-BEEF DEVELOPMENT PROJECT
Dairy Farm Development Projections

Model 2: 40-Cow Dairy Farm
Investment Cost Projections

Investment Item	Unit	Average Unit Per Farm	Average Unit Cost	Average Cost Per Farm	Development Phasing Farm Year 1	Farm Year 2	Farm Year 3	Total Cost for 100 Farms (Won '000,000)	Total Cost for 100 Farms (US$ '000)
				(Won '000)					
Pasture Establishment 1/	ha	36	10 1/	360	150	110	100	36	118
Farm Structures:									
Cow barn 2/	AU	50	40	2,000	1,000	500	500	200	656
Silo and hay shed	AU	50	12	600	400	-	200	60	197
Fencing	ha	36	9	330	130	100	100	33	108
Cattle 3/	head	21	125	2,630	-	2,630	-	263	862
Machinery and Equipment:									
Tractor and attachments	set	1	2,500	2,500	2,500	-	-	250	820
Milking machine 4/	unit	1	1,000	1,000	-	-	1,000	100	328
Total				9,420	4,180	3,340	1,900	942	3,089

1/ In addition the Government provides a subsidy of about 62,000 Won/ha for pasture establishment in the form of fertilizer, lime, pasture seeds and foodgrains
2/ Loose housing and milking shed plus self-feeding silage.
3/ One-year old grade Friesian heifers at a CIF cost of 390 US$/head, port of Pusan, 119,000 Won, plus quarantine and other costs equivalent to 6,000 Won/head.
4/ Including cooling equipment and containers.
Note: Figures are rounded.

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ANNEX 4
Table 5

ANNEX 4
Table 6

KOREA
INTEGRATED DAIRY-BEEF DEVELOPMENT PROJECT

Dairy Farm Development Projections

Model 2: 40-Cow Dairy Farm
Herd Projection

CATEGORY	Unit	Value Won	Farm Year 1	2	3	4	5	6	7	8	9-11
HERD COMPOSITION 1/											
Cows	No.	180,000	-	-	17	16	21	22	25	29	31
In-calf Heifers, 9 - 24 mo.	No.	180,000	-	19	-	8	7	9	12	11	9
Calves - Females	No.	60,000	-	-	8	8	11	13	14	13	10
- Males	No.	60,000	-	-	9	7	11	7	2	-	-
Total	No.		-	19	34	39	50	51	53	53	50
Total Animal Units	No.		-	19	17	24	28	31	37	40	40
BIRTHS											
Heifer Calves	No.		-	-	9	9	12	14	15	18	20
Bull Calves	No.		-	-	10	8	12	14	16	19	20
Total	No.		-	-	19	17	24	28	31	37	40
PURCHASES											
Heifers - not mated	No.	125,000	-	21	-	-	-	-	-	-	-
Total	No.		-	21	-	-	-	-	-	-	-
MORTALITY											
Adults	No.		-	-	1	-	1	1	1	1	1
Calves - Heifers	No.		-	-	1	1	1	1	2	2	2
- Bulls	No.		-	-	1	1	1	2	1	2	2
Heifers, 9 - 24 months	No.		-	-	-	-	-	1	-	1	1
Bulls, 9 - 24 months	No.		-	-	-	-	1	-	-	-	-
Total	No.		-	-	3	2	4	5	4	6	6
SALES											
Cull Cows	No.	125,000	-	-	1	1	2	5	5	7	8
In-calf Heifers	No.	180,000	-	-	-	-	-	-	-	1	2
Barren Heifers	No.	100,000	-	2	-	-	1	1	1	1	1
Bulls, 9 - 24 months	No.	140,000	-	-	-	9	6	11	7	2	-
Heifer Calves	No.	25,000	-	-	-	-	-	-	-	3	8
Bull Calves	No.	20,000	-	-	-	-	-	5	12	17	18
Total	No.		-	2	1	10	9	22	25	31	37

TECHNICAL COEFFICIENTS

Calving Interval - 14 months
Conception Rate - 88%
Culling Percentage - 18% 2/
Calving Rate - 100%

Lactation Length - 280 days
Milk Yield:
1st Lactation - 2,600 kg
Subsequent - 3,500 kg

Mortality:
Adults - 3%
Cattle 9-24 mo. - 4%
Calves 0-9 mo. - 20%
Age of 1st Calving - 24 mo.

1/ End of year figures.
2/ Cows not in-calf are included in culling percentage.

October 30, 1970

KOREA

INTEGRATED DAIRY-BEEF DEVELOPMENT PROJECT
Dairy Farm Development Projections

Model 2: 40 Cow Dairy Farm

Sales, Operating Expenses, and Net Operating Income

	Unit	Unit Price (Won)	Farm Year 1	2	3	4	5	6	7	8	9	10	11
			(Won '000)										
SALES													
Milk	2	50	-	-	2,340	2,975	3,665	4,410	4,845	5,630	6,330	6,420	6,420
Cattle		1/	-	200	125	1,385	1,190	2,365	1,945	1,850	2,020	1,685	1,685
Total			-	200	2,465	4,360	4,855	6,775	6,790	7,480	8,350	8,105	8,105
OPERATING EXPENSES													
Fertilizer	ha	10,000	70	150	260	360	360	360	360	360	360	360	360
Reseeding and Liming	ha	8,000	-	-	-	70	70	70	70	70	70	70	70
Corn Seed 2/	ha	4,000	36	36	36	36	36	36	36	36	36	36	36
Labor	man/year	180,000	-	180	360	360	360	360	360	360	360	360	360
Feed:													
Milk cows	head/year	22,000 3/	-	-	396	374	506	594	660	770	858	858	858
Dry cows	" "	13,000 4/	-	273	221	416	468	533	468	351	260	130	130
Veterinary and AI			-	84	106	132	164	190	192	194	196	176	176
Machinery Operation and Maintenance			150	300	300	300	300	300	300	300	300	300	300
Building Maintenance			-	75	75	75	75	75	75	75	75	75	75
Miscellaneous			10	20	20	20	20	20	20	20	20	20	20
Subtotal			266	1,118	1,774	2,143	2,359	2,538	2,541	2,536	2,535	2,385	2,385
Total 5/			290	1,230	1,950	2,360	2,600	2,790	2,800	2,790	2,790	2,620	2,620
NET OPERATING INCOME 6/			(290)	(1,030)	515	2,000	2,255	3,985	3,990	4,690	5,560	5,485	5,485

1/ See Table 6.
2/ Two sowings of 50 kg/ha each on 2.5 ha.
3/ 1,000 kg/cow/year at 22 Won/kg.
4/ 700 kg/AU/year at 22 Won/kg.
5/ Including a contingency allowance of about 10%.
6/ Before debt service.

ANNEX Table 7

October 20, 1970

INTEGRATED DAIRY-BEEF DEVELOPMENT PROJECT

Dairy Farm Development Projections

Model 2: 40-Cow Dairy Farm
Financial Projections

	Farm Year										
	1	2	3	4	5	6	7	8	9	10	11
	(Won'000)										
Cash Inflow											
Sales	-	200	2,465	4,360	4,855	6,775	6,790	7,480	8,350	8,105	8,105
Loan:											
Long-term	3,135	2,505	1,425	-	-	-	-	-	-	-	-
Short-term	465	2,045	2,275	985	300	-	-	-	-	-	-
Farmer's Contribution	1,045	835	475	-	-	-	-	-	-	-	-
Total	4,645	5,585	6,640	5,345	5,155	6,775	6,790	7,480	8,350	8,105	8,105
Cash Outflow											
Investment	4,180	3,340	1,900	-	-	-	-	-	-	-	-
Operating Expenses	290	1,230	1,950	2,360	2,600	2,790	2,800	2,790	2,790	2,620	2,620
Total	4,470	4,570	3,850	2,360	2,600	2,790	2,800	2,790	2,790	2,620	2,620
Annual Cash Balance Before Debt Service	175	1,015	790	2,985	2,555	3,985	3,990	4,690	5,560	5,485	5,485
Debt Service											
Long-term Debt:											
Interest (9%)[1]	140	395	572	686							
Annuity	-	-	-	-	1,549	1,549	1,549	1,549	1,549	1,549	-
Short-term Debt:											
Interest (15%)	35	157	173	74	21	-	-	-	-	-	-
Annuity		448	2,045	2,275	985	300	-	-	-	-	-
Total	175	1,015	2,790	2,985	2,255	1,849	1,549	1,549	1,549	1,549	-
Annual Cash Balance After Debt Service	-	-	-	-	-	2,136	2,441	3,141	4,011	3,936	5,485

[1] For calculation purposes it is assumed that on-average long-term loans would be for 9 years including 3 years of grace, and that they would be amortized on an equal semi-annual annuity payment plan.

October 20, 1970

ANNEX 4
Table 8

KOREA

INTEGRATED DAIRY-BEEF DEVELOPMENT PROJECT

Dairy Processing Facilities Development Projections

Central District Processing Facilities

Investment Projections[1/]

	Project Year					
	1	2	3	4	Total Cost	
	(Won'000,000)					(US$'000)
Collecting Station						
Land and Site Improvements	-	3.7	-	-	3.7	
Buildings and Structures	-	7.5	-	-	7.5	
Machinery and Utilities	-	18.0	-	-	18.0	
Vehicles	-	12.6	9.0	7.0	28.6	
Office and Other Equipment	-	3.0	-	-	3.0	
Subtotal	-	44.8	9.0	7.0	60.8	199.0
Seoul Processing Plant						
Land and Site Improvements	-	55.0	-	-	55.0	
Buildings and Structures	-	41.9	-	5.3	47.2	
Machinery and Utilities	-	86.5	22.0	56.0	164.5	
Office and Other Equipment	-	3.0	-	-	3.0	
Vehicles	-	1.6	-	-	1.6	
Subtotal	-	188.0	22.0	61.3	271.3	887.0
Distribution Stations						
Land and Site Improvements	-	3.2	1.6	-	4.8	
Buildings and Structures	-	2.6	1.3	-	3.9	
Machinery and Utilities	-	2.0	1.0	-	3.0	
Office and Other Equipment	-	0.6	0.3	-	0.9	
Vehicles	-	10.0	8.0	-	18.0	
Subtotal	-	18.4	12.2	-	30.6	100.0
Total	-	251.2	43.2	68.3	362.7	1,186.0

ANNEX
Table 1

1/ Each item includes a contingency allowance of about 10%. Installed costs are quoted for machinery, utilities and equipment.

October 20, 1970

KOREA

INTEGRATED DAIRY-BEEF DEVELOPMENT PROJECT

Dairy Processing Facilities Development Projections

Central District Processing Facilities

Sales, Operating Expenses and Net Operating Income
(Won million)

	Project Year										
	1	2	3	4	5	6	7	8	9	10	11-13
SALES	-	-	352.0	657.0	856.0	1,088.0	1,142.0	1,274.0	1,274.0	1,353.0	1,371.0
OPERATING EXPENSES											
Milk	-	-	200.0	405.0	512.0	650.0	685.0	760.0	760.0	805.0	815.0
Collecting Station											
Payroll	-	-	9.4	11.2	12.8	13.6	13.6	13.6	-	13.6	-
Milk Cooling Expenses	-	-	1.9	2.5	2.9	3.3	3.3	3.7	-	3.8	-
Vehicles :											
Fuel and Oil	-	-	2.5	6.0	7.4	8.9	7.6	7.6	-	7.6	-
Repair, Replacement and Maintenance	-	-	5.5	10.6	13.7	15.6	14.3	14.3	-	14.3	-
General Overhead	-	-	2.3	3.2	4.1	4.3	4.3	4.5	-	4.6	-
Subtotal	-	-	21.6	33.5	40.9	45.7	43.1	43.7	43.7	43.9	43.9
Seoul Plant											
Payroll	-	-	15.4	17.7	22.0	29.5	-	-	-	-	-
Processing :											
Containers	-	-	36.3	59.0	81.7	103.3	-	-	-	-	-
Other Materials	-	-	4.4	5.8	7.2	8.5	-	-	-	-	-
Fuel and Power	-	-	9.9	12.5	15.0	18.8	-	-	-	-	-
Repairs and Maintenance	-	-	3.2	3.2	4.0	5.0	-	-	-	-	-
Vehicles	-	-	1.4	1.4	1.9	2.4	-	-	-	-	-
General Overhead	-	-	8.1	10.9	13.9	16.9	-	-	-	-	-
Subtotal	-	-	78.7	110.5	145.7	184.4	193.0	216.0	216.0	231.0	235.0
Distribution Stations											
Payroll	-	-	2.7	4.3	4.3	4.6	-	-	-	-	-
Refrigerating Equipment	-	-	0.9	1.3	1.3	1.4	-	-	-	-	-
Vehicles :											
Fuel and Oil	-	-	1.1	1.8	2.2	2.3	-	-	-	-	-
Repair, Replacement and Maintenance	-	-	4.3	7.4	8.4	9.4	-	-	-	-	-
General Overhead	-	-	1.2	1.8	2.0	2.2	-	-	-	-	-
Subtotal	-	-	10.2	16.6	18.2	19.9	20.6	23.4	23.4	25.0	25.3
Interest on Working Capital			5.0	5.0	-	-	-	-	-	-	-
Total expenses	-	-	315.5	570.6	716.8	900.0	941.7	1043.1	1043.1	1104.9	1119.2
NET OPERATING INCOME[1/]	-	-	36.5	86.4	139.2	188.0	200.3	230.9	230.9	248.1	251.8

1/ Before debt service, allowances for resources and depreciation.

October 20, 1970.

ANNEX 5
TABLE 7

KOREA

INTEGRATED DAIRY-BEEF DEVELOPMENT PROJECT

Dairy Processing Facilities Development Projections

Central District Processing Facilities
Financial Projections
(Won million)

	Project Year											
	1	2	3	4	5	6	7	8	9	10	11	12
Cash Inflow												
Sales	-	-	352	657	856	1,088	1,142	1,274	1,274	1,353	1,371	1,371
Loan:												
Long-term	-	200	35	55	-	-	-	-	-	-	-	-
Short-term 1/	-	2	50	50	-	-	-	-	-	-	-	-
Equity Contribution	-	51	8	13	-	-	-	-	-	-	-	-
Total	-	253	445	775	856	1,088	1,142	1,274	1,274	1,353	1,371	1,371
Cash Outflow												
Investment	-	251	43	68	-	-	-	-	-	-	-	-
Operating Expenses	-	-	311	566	717	900	942	1,043	1,043	1,105	1,119	1,119
Total	-	251	354	634	717	900	942	1,043	1,043	1,105	1,119	1,119
Annual Cash Balance Before Debt Service	-	2	91	141	139	188	200	231	231	248	252	252
Debt Service												
Long-term loan:												
Interest (5%)	-	2	5	7	7							
Annuity 2/						28	28	28	28	28	30	-
Short-term loan:												
Interest (18%)	-	-	5	5	-	-	-	-	-	-	-	-
Amortization	-	-	2	50	50	-	-	-	-	-	-	-
Total	-	2	12	62	57	28	28	28	28	28	30	-
Annual Cash Balance After Debt Service	-	-	79	79	82	160	172	203	203	220	222	252

1/ Working capital from AFDC
2/ Based on equal semi-annual annuity payment plan of 6 years after 4-year grace period

October 20, 1979

ANNEX 5
Table 3

KOREA

INTEGRATED DAIRY-BEEF DEVELOPMENT PROJECT

Dairy Processing Facilities Development Projections

Honam District Processing Facilities

Investment Projections 1/

	Project Year				Total Cost	
	1-2	3	4	5		
	(Won '000,000)					(US$'000)
Kwangju Processing Plant						
Land and Site Improvements	-	22.0	-	-	22.0	72.2
Buildings and Structures	-	76.8	-	-	76.8	252.0
Machinery and Utilities	-	177.4	9.4	88.2	275.0	902.0
Office and Other Equipment	-	4.5	-	-	4.5	14.8
Vehicles	-	11.6	4.0	9.0	24.6	80.7
Subtotal	-	292.3	13.4	97.2	402.9	1321.7
Distribution System						
Land and Site Improvements	-	-	-	1.6	1.6	5.2
Buildings and Structures	-	-	-	1.3	1.3	4.3
Machinery and Utilities	-	-	-	1.0	1.0	3.3
Office and Other Equipment	-	-	-	.3	.3	1.0
Vehicles	-	-	-	5.0	5.0	16.4
Subtotal	-	-	-	9.2	9.2	30.2
Total	-	292.3	13.4	106.4	412.1	1351.9

1/ Each item includes a contingency allowance of about 10%. Installed costs are quoted for machinery, utilities and equipment.

October 20, 1970

ANNEX 5
Table 4

KOREA

INTEGRATED DAIRY-BEEF DEVELOPMENT PROJECT

Dairy Processing Facilities Development Projections

Honam District Processing Facilities

Sales, Operating Expenses and Net Operating Income
(Won million)

	Project Year											
	1-2	3	4	5	6	7	8	9	10	11	12	13
SALES	-	-	641.0	726.0	1,196.0	1,432.0	1,554.0	1,611.0	1,696.0	1,709.0	1,715.0	1,715.0
OPERATING EXPENSES												
Milk	-	-	345.0	389.0	640.0	766.0	830.0	860.0	900.0	910.0	915.0	915.0
Payroll	-	-	21.9	23.0	28.4	30.9	31.2	30.1	30.7	30.7	30.7	30.7
Processing												
Containers	-	-	104.9	118.6	195.5	234.0	254.0	263.0	275.5	278.7	280.0	280.0
Ingredients	-	-	69.0	78.1	129.1	154.3	167.5	173.5	181.8	183.7	184.7	184.7
Other Materials	-	-	.8	.8	1.3	1.6	1.7	1.7	1.8	1.8	1.8	1.8
Fuel and Power	-	-	7.7	8.5	14.0	16.7	18.2	18.8	19.7	20.0	20.1	20.1
Repairs and Maintenance	-	-	4.0	4.0	5.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Vehicles												
Fuel and Oil	-	-	1.8	2.5	3.2	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Repair, Replacement and Maintenance	-	-	5.6	8.3	13.0	14.3	13.6	11.1	11.1	11.1	11.1	11.1
General Overhead	-	-	6.3	7.1	10.1	11.6	12.3	12.5	12.9	12.9	12.9	12.9
Interest on Working Capital	-	-	5.0	5.0	-	-	-	-	-	-	-	-
Total Expenses	-	-	572.0	644.9	1,039.6	1,238.9	1,339.0	1,381.2	1,444.0	1,459.4	1,466.8	1,466.8
NET OPERATING INCOME 1/	-	-	69.0	81.1	156.4	193.1	215.0	229.8	242.0	246.6	248.2	248.2

1/ Before long-term debt service, allowances for reserves and depreciation.

October 20, 1970

ANNEX 5
Table 5

KOREA

INTEGRATED DAIRY-BEEF DEVELOPMENT PROJECT

Dairy Processing Facilities Development Projections

Honam District Processing Facilities

Financial Projections
(Won million)

	Project Year											
	1-2	3	4	5	6	7	8	9	10	11	12	13
Cash Inflow												
Sales	-	-	641	726	1,196	1,432	1,554	1,611	1,686	1,706	1,715	1,715
Loan:												
Long-term	-	234	11	85	-	-	-	-	-	-	-	-
Short-term 1/	-	3	60	60	-	-	-	-	-	-	-	-
Equity Contribution	-	58	2	21	-	-	-	-	-	-	-	-
Total	-	295	714	892	1,196	1,432	1,554	1,611	1,686	1,706	1,715	1,715
Cash Outflow												
Investment	-	292	13	106	-	-	-	-	-	-	-	-
Operating Expenses	-	-	567	640	1,040	1,239	1,339	1,381	1,441	1,459	1,467	1,467
Total	-	292	580	746	1,040	1,239	1,339	1,381	1,441	1,459	1,467	1,467
Annual Cash Balance Before Debt Service	-	3	134	146	156	193	215	230	245	247	248	248
Debt Service												
Long-term Loan:												
Interest (5%)	-	3	7	8								
Annuity 2/	-	-	-	-	40	40	40	40	40	40		
Short-term Loan:												
Interest (18%)	-	-	5	5	-	-	-	-	-	-	-	-
Amortisation	-	-	3	60	60	-	-	-	-	-	-	-
Total	-	3	15	73	100	40	40	40	40	40	-	-
Annual Cash Balance After Debt Service	-	-	119	73	56	153	175	190	205	207	248	248

1/ Working capital from AFDC.
2/ Based on equal semi-annual annuity payment plan of 6 years, after 4-year grace period

October 20, 1970

ANNEX 5
Table 6

KOREA

INTEGRATED DAIRY BEEF DEVELOPMENT PROJECT

Management and Technical Services

Investments Projections

CATEGORY	Number	Project Year 1	2	3	4	5	Total	Cost
		(- - - - - - - - - - Won '000,000 - - - - - - - - - -)						(US$'000)
Central office building	550 m^2	10.0	-	-	-	-	10.0	33
Project vehicles:	-							
Automobiles/jeeps	13	12.7	-	-	-	-	12.7	42
Motorcycles	6	0.9	-	-	-	-	0.9	3
Furniture and equipment	-	6.6	-	-	-	-	6.6	21
Materials and equipment 1/	-	14.0	-	-	-	-	14.0	46
Training Grants	3 man/years	-	3.1	3.0	-	-	6.1	20
Salaries:								
Project specialists 2/	13 man/years	29.3	41.0	41.0	25.0	10.1	146.4	480
Local staff	-	27.4	30.4	32.4	32.7	32.7	155.6	511
Semen	-	-	-	1.6	5.3	5.3	12.2	40
Office supplies and utilities	-	1.8	1.9	1.9	2.0	2.0	9.6	31
Sales expense	-	10.0	20.0	20.0	20.0	20.0	90.0	295
Per-diem and miscellaneous	-	5.8	6.5	7.0	7.0	7.0	33.3	110
Gas, oil, repairs	-	9.0	9.0	9.0	9.0	9.0	45.0	147
Contingency-about 10%		12.5	13.1	14.1	9.0	8.9	57.6	188
Total		140.0	125.0	130.0	110.0	95.0	600.0	1,967

1/ Laboratory and other research equipment, e.g., scales, seed cleaner, fertilizer and seed for field trials and multiplication.

2/ Animal Husbandry Specialist 5 years; Dairy Processing Specialist or Consultant Services 3 years; Agronomy Specialist 3 years; and Animal Nutrition Specialist 2 years.

October 20, 1970

ANNEX 6

KOREA

INTEGRATED DAIRY-BEEF DEVELOPMENT PROJECT

Project Cost by Major Investment Categories and Foreign Exchange Component

CATEGORY	Won (million) Local	Won (million) Foreign	Won (million) Total	US$ (thousands) Local	US$ (thousands) Foreign	US$ (thousands) Total	% Foreign Exchange
Dairy Farm Development							
Pasture Establishment	84	9	93	275	30	305	10
Farm Structures	750	83	833	2,459	273	2,732	10
Cattle and Semen	39	748	787	129	2,454	2,583	95
Machinery and Equipment	242	449	691	793	1,473	2,266	65
Subtotal	1,115	1,289	2,404	3,656	4,230	7,886	54
Dairy Processing Facilities							
Central District:							
Collecting Station	33	28	61	109	90	199	45
Seoul Processing Plant	162	108	270	532	355	887	40
Distribution Stations	14	17	31	45	55	100	55
Honam District:							
Kwanju Processing Plant	201	202	403	661	661	1,322	50
Distribution System	4	5	9	12	18	30	6
Subtotal	444	360	774	1,359	1,179	2,538	46
Management and Technical Services							
Central Office Building	11	-	11	36	-	36	-
Vehicles	5	10	15	18	32	50	65
Furniture and Equipment	7	-	7	23	-	23	-
Materials and Equipment	10	5	15	32	18	50	35
Training Grants	7	-	7	-	22	22	100
Project Specialists - salaries and allowances	-	160	160	-	525	525	100
Local Staff - salaries	171	-	171	562	-	562	-
Semen	-	13	13	-	44	44	100
Office Supplies and Utilities	10	-	10	34	-	34	-
Sales Expense	99	-	99	325	-	325	-
Per diem and miscellaneous	37	-	37	121	-	121	-
Gas, Oil and Repairs	40	10	50	132	33	165	20
Subtotal	397	198	595	1,283	674	1,957	34
Working Capital	100	-	100	329	-	329	-
Total Project Cost	2,026	1,847	3,873	6,627	6,083	12,710 1/	-

1/ Rounded to US$12.6 million

ANNEX 7

KOREA

INTEGRATED DAIRY BEEF DEVELOPMENT PROJECT

Financial Projection for KDBC Project Account
(Won Million)

	Project Year													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14-15
SOURCE OF FUNDS														
IDA Credit														
Dairy farm loans	125	388	450	325	66	-	-	-	-	-	-	-	-	-
Dairy processing plants	-	200	269	66	85	-	-	-	-	-	-	-	-	-
Technical services	61	45	47	31	16	-	-	-	-	-	-	-	-	-
Government Contribution for Dairy Farm Loans	42	129	150	108	22	-	-	-	-	-	-	-	-	-
AFDC/Government Equity[1] Capital for Dairy Plants	-	50	67	17	21	-	-	-	-	-	-	-	-	-
AFDC/Government Equity[1] Capital for working capital	75	15	-	-	-	-	-	-	-	-	-	-	-	-
Working Capital from AFDC	-	35	-	-	-	-	-	-	-	-	-	-	-	-
Sales														
Central District dairy plant	-	-	352	657	856	1,088	1,142	1,274	1,274	1,353	1,371	1,371	1,371	1,371
Honam District dairy plant	-	-	-	641	726	1,196	1,432	1,554	1,611	1,686	1,706	1,715	1,715	1,715
Dairy Farm Loans														
Interest (9%)[2]	8	38	89	120	97	47	8	-	-	-	-	-	-	-
Amortization	-	-	-	37	150	282	377	396	394	361	249	114	21	-
TOTAL	311	900	1,424	2,002	2,039	2,613	2,959	3,224	3,279	3,400	3,326	3,200	3,107	3,086
APPLICATION OF FUNDS														
Development														
Dairy farm loans	167	517	600	433	88	-	-	-	-	-	-	-	-	-
Dairy processing plants	-	250	336	83	106	-	-	-	-	-	-	-	-	-
Technical services	61	45	47	31	16	-	-	-	-	-	-	-	-	-
Operating Expenses														
Central District dairy plant	-	-	311	566	717	900	942	1,043	1,043	1,105	1,119	1,119	1,119	-
Honam District dairy plant	-	-	-	567	640	1,040	1,239	1,339	1,381	1,441	1,459	1,467	1,467	-
KDBC - headquarters	80	80	80	80	80	100	110	120	130	140	150	150	150	-
Debt Service														
To Government	-	7	42	85	105	117	358	358	358	358	358	358	358	358
To AFDC for working capital	-	-	6	41	-	-	-	-	-	-	-	-	-	-
Cash Balance	3	1	2	116	287	456	310	384	367	356	240	106	13	(8)
TOTAL	311	900	1,424	2,002	2,039	2,613	2,959	3,224	3,279	3,400	3,326	3,200	3,107	3,086

1/ AFDC/Government contribution to KDBC for construction and working capital of the dairy processing plants would be equity capital and non-repayable. (Additional working capital of about 35 million won would be loaned by AFDC to KDBC on short-term at 18% interest).

2/ Calculated on basis of 9-year average loan term including 3 years of grace. Income shown as interest relates to those amounts of principal outstanding but for which no principal installments have matured. Thereafter, interest and principal payments are merged and calculated on basis of equal semi-annual annuity payments.

3/ Based on total loan of about 2.6 billion won to be repaid in 15 years including 6 years of grace. Interest calculated at 3% for IDA and Government funds used for dairy farm development and techni[redacted]rvices and 9% for IDA funds used for dairy processing facilities[redacted]s loan would be covered by the First Subsidiary Loan Agreement between Governme[redacted] KDBC.

January 26, 1971.

ANNEX 8

KOREA

INTEGRATED DAIRY-BEEF DEVELOPMENT PROJECT

Disbursements

Phasing of IDA Disbursements (Annual)
(US$'000)

	Project Year					
	1	2	3	4	5	Total
Dairy Farm Development						
Model 1 - Farm Plans Initiated	200	200	200	-	-	600
Pasture Establishment	3	4	6	4	2	19
Farm Structures	38	37	75	-	37	187
Cattle and Semen	-	573	573	573	-	1,719
Machinery and Equipment	152	152	254	102	102	762
Subtotal	193	766	908	679	141	2,687
Model 2- Farm Plans Initiated	35	35	30	-	-	100
Pasture Establishment	2	3	4	2	1	12
Farm Structures	19	25	33	16	8	101
Cattle and Semen	-	284	284	291	-	859
Machinery and Equipment	195	195	247	79	67	783
Subtotal	216	507	568	388	76	1,755
Dairy Processing Facilities						
Central District	-	515	180	135	-	830
Honam District	-	-	640	100	390	1,130
Subtotal	-	515	820	235	390	1,960
Management and Technical Services						
Project Specialists	100	140	140	85	35	500
Materials and Equipment	50	-	-	-	-	50
Transport (vehicles)	50	-	-	-	-	50
Semen	-	-	5	17	18	40
Training Grants	-	10	10	-	-	20
Subtotal	200	150	155	102	53	660
Total	609	1,938	2,451	1,404	660	7,062 1/
Percent of Total	9	27	35	20	9	100

1/ Rounded to US$7 million.

ANNEX 9
Table 2

KOREA

INTEGRATED DAIRY-BEEF DEVELOPMENT PROJECT

Disbursements

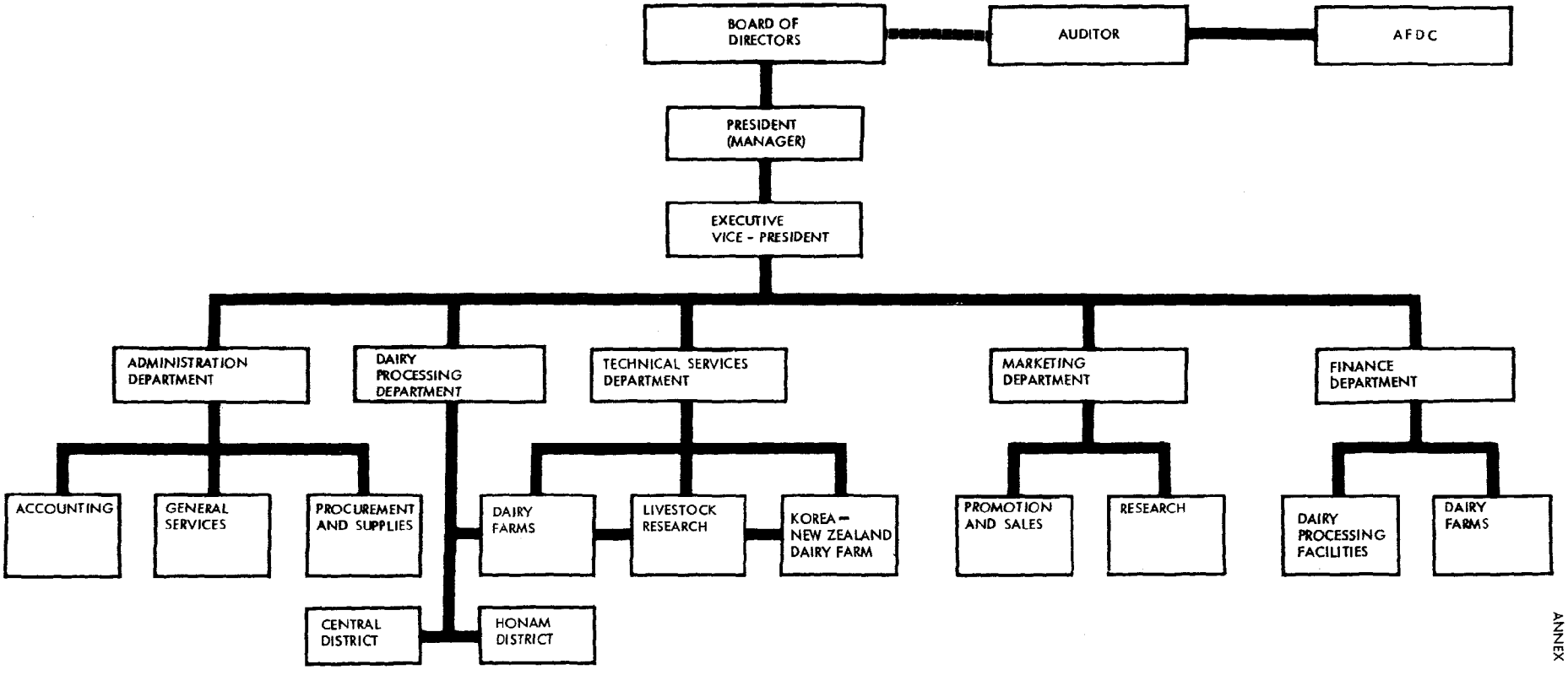
Estimated Schedule of Quarterly Disbursement of US$7 Million Credit
(US$ '000)

Quarter Ending	Disbursed	Balance	Quarter Ending	Disbursed	Balance
1971			1975		
Dec. 31	150	6,850	March 31	400	1,250
1972			June 30	400	850
March 31	150	6,700	Sept. 30	200	650
June 30	150	6,550	Dec. 31	200	450
Sept. 30	150	6,400	1976		
Dec. 31	450	5,950	March 31	150	300
1973			June 30	150	150
March 31	500	5,450	Sept. 30	150	-
June 30	500	4,950			
Sept. 30	500	4,450			
Dec. 31	600	3,850			
1974					
March 31	600	3,250			
June 30	600	2,650			
Sept. 30	600	2,050			
Dec. 31	400	1,650			

KOREA

INTEGRATED DAIRY-BEEF DEVELOPMENT PROJECT

ORGANIZATION CHART FOR KOREA DAIRY BEEF CO.



SOURCE: IDA MISSION

ANNEX 10

IBRD-5044(R)

KOREA

INTEGRATED DAIRY-BEEF DEVELOPMENT PROJECT

Terms of Reference for Management and Technical Services

1. Technical Director - Dairy Husbandry Specialist - would act as a Technical Director within the Department of Technical Services, Korea Dairy Beef Co., (KDBC). Including, but not limiting the generality thereof, he would have the following minimum specific duties, responsibilities and powers, which he might delegate in whole or in part to assigned technical staff:

(a) advising the administrative officials, (President and Director, Department of Technical Services) on major policy decisions in respect to the Dairy Farm Development Sub-project;

(b) executing the Sub-project in accordance with policies and procedures agreed to with KDBC administrative officials;

(c) recommending to KDBC the employment of the livestock technicians needed to carry out Sub-project activities;

(d) prescribing the duties and responsibilities of the livestock technicians and training them in the technical and economic aspects of livestock production and to prepare dairy farm development plans;

(e) approving or disapproving dairy farm development plans prepared and appraised under the Sub-project and recommending approved plans to KDBC for lending;

(f) inter alia, providing guidance on farm buildings, including design and specifications for type and design of cow barns, and feeding arrangements; design and specifications of milking parlors and milking plants; milking practices, hygienic milk production, mastitis identification and control; approving the selection of imported female dairy stock and the cycling of imported stock to approved participating farmers; organizing, approving and giving overall supervision to the AI technical service; and, in cooperation with KDFC's milk processing plants, establishing a quality control service;

(g) providing such supervision and technical assistance as necessary to ensure successful completion of each dairy farm development plan and loan;

(h) establishing a farm accounts system, with particular attention to maintaining an adequate sample of farm records as needed for Project evaluation; and

(i) giving assistance and cooperation to the Agronomy and Animal Nutrition Specialists to carry out their terms of reference.

2. Agronomy Specialist - would be attached to and administratively responsible to the Department of Technical Services, KDBC. Including, but not limiting the generality thereof, he would have the following minimum specific duties and responsibilities:

(a) carrying out investigational work to determine the most suitable grass, forage and legume plants for Korean conditions, including:

(i) methods of establishment and cultivation techniques;

(ii) seeding rates;

(iii) response to fertilizers, and

(iv) grassland and forage management, stocking rates and the role grazing can play;

(b) carrying out studies on a regional basis on yields of hay or silage from rice paddy that may be double-cropped and techniques of harvesting and conserving this feed;

(c) investigating the cheapest method of establishing reseeded pasture on unused upland and comparison of costs when performed manually and mechanically;

(d) investigating methods for developing rangeland for grazing, including techniques of oversowing legume and response to surface application of fertilizer and lime;

(e) formulating and supervising a scheme for pasture and forage seed multiplication with participating Project farmers, or other farmers, using imported foundation seed;

(f) coordinating and cooperating with the UNDP/FAO Korean Uplands Development and Watershed Management Project on pilot investigations of the yield of hay and silage from double-cropped rice paddy land and the development of rangeland pasture; and

(g) coordinating this Sub-project activity with the resources of the Ministry of Agriculture and Forestry to yield requisite data and information for preparation of a possible Phase II livestock development project.

3. Animal Nutrition Specialist - would be attached to and administratively responsible to the Technical Services Department, KDBC. Including, but not limiting the generality thereof, he would have the following minimum specific duties and responsibilities:

(a) conducting trial work on establishing the most economic feeding regimen for different categories of livestock, entailing:

(i) feeding trials with forages harvested at different stages of growth and stored as silage or hay;

(ii) the response to different levels of concentrate feeding in combination with different types and quality of forage; and

(iii) the response to concentrates when animals are grazed or fed green silage crops;

(b) comparing different methods of feeding, including stall feeding, self-feed or easy feeding methods;

(c) developing comparative information on various winter systems; and

(d) coordinating this Sub-project activity with the resources of the Ministry of Agriculture and Forestry to yield requisite information and data for preparation of a possible phase II livestock development project.

4. Technical Director - Dairy Processing Facilities - would be attached to and administratively responsible to the Dairy Processing Department, KDBC. It is envisaged that this might be a package contract which, inter alia, would have the following specific duties and functions:

(a) advising the administrative officials (President and Director, Department of Dairy Processing) on major policy decisions in respect to the Dairy Products Processing Facilities Sub-project;

(b) giving guidance for the development of the Sub-project including:

(i) siting of facilities;

(ii) design, layout and specifications of structures and equipment;

(iii) preparation of international and national tenders for materials, equipment, utilities, and labor;

(iv) evaluation of tenders and recommendation of awardee; and

(v) supervision of construction, installation of equipment and utilities;

(c) guiding management and training key personnel for the start-up operations (one to two years) of the facilities.

KOREA

INTEGRATED DAIRY-BEEF DEVELOPMENT PROJECT

Financial Rates of Return

	Farm or Plant Year											Financial Rate of Return Over 11 Yr. (%)
	1	2	3	4	5	6	7	8	9	10	11	
	('000 Won)											
Model 1 - 10-Cow Dairy Farm												26
Sales	-	-	910	1,790	1,820	2,115	2,015	1,840	2,015	2,015	2,015	
Incremental Value of Herd	-	-	-	-	-	-	-	-	-	-	1,980	
Operating Expenses	(65)	(480)	(680)	(820)	(800)	(820)	(810)	(800)	(810)	(810)	(810)	
Interest on Short-Term Borrowing	(8)	(64)	(60)	-	-	-	-	-	-	-	-	
On-Farm Investment	(920)	(890)	(628)	-	-	-	-	-	-	-	-	
Balance	(993)	(1,434)	(458)	970	1,020	1,295	1,205	1,040	1,205	1,205	3,185	
Sensitivity Analysis												
Assumptions:												
Milk price decreases from 50 Won/l to 35 Won/l												15
Rate of exchange is devalued from 305 Won/US$ to 450 Won/US$												22
Cost of feed doubles												18
Cost of feed decreases by 50%												31
Milk yield increases by 15%												32
Model 2 - 40-Cow Dairy Farm												23
Sales	-	200	2,465	4,360	4,855	6,775	6,790	7,480	8,350	8,105	8,105	
Incremental Value of Herd	-	-	-	-	-	-	-	-	-	-	7,800	
Operating Expenses	(290)	(1,230)	(1,950)	(2,360)	(2,600)	(2,790)	(2,800)	(2,790)	(2,790)	2,620	2,620	
Interest on Short-Term Borrowing	(40)	(157)	(189)	(63)	-	-	-	-	-	-	-	
On-Farm Investment	(4,180)	(3,340)	(1,900)	-	-	-	-	-	-	-	-	
Balance	(4,510)	(4,527)	(1,574)	1,937	2,255	3,985	3,990	4,690	5,560	5,485	13,285	
	('000,000 Won)											
Central District Processing Facilities												38
Sales	-	359	657	856	1,088	1,142	1,274	1,274	1,353	1,371	1,371	
Residual Value of Land	-		-	-	-	-	-	-	-	-	64	
Operating Expenses	-		(571)	(717)	(900)	(942)	(1,043)	(1,043)	(1,105)	(1,119)	(1,119)	
Investment	(251)	(43)	(68)	-	-	-	-	-	-	-	-	
Balance	(251)	(7)	18	139	188	200	231	231	248	252	316	
Honam District Processing Facilities												37
Sales	-	641	726	1,196	1,432	1,554	1,611	1,686	1,706	1,715	1,715	
Operating Expenses	-	(572)	(645)	(1,040)	(1,239)	(1,339)	(1,381)	(1,444)	(1,459)	(1,467)	(1,467)	
Investment	(292)	(13)	(106)	-	-	-	-	-	-	-	-	
Balance	(293)	56	(25)	156	193	215	230	247	247	248	248	

October 20, 1970

ANNEX 12

KOREA

INTEGRATED DAIRY BEEF DEVELOPMENT PROJECT

Economic Rate of Return[1/]

	Project Year												
	1	2	3	4	5	6	7	8	9	10	11	12	13
	(Won '000,000)												
Dairy Farms													
Sales:													
Milk[2/]	-	-	259	602	991	1,207	1,357	1,492	1,556	1,608	1,635	1,635	1,635
Cattle	-	7	11	170	304	470	446	438	407	399	394	394	394
Incremental Value of the Herd	-	-	-	-	-	-	-	-	-	-	653	653	661
Operating Expenses	(25)	(174)	(392)	(632)	(752)	(813)	(826)	(834)	(832)	(827)	(821)	(821)	(821)
On-Farm Investment	(375)	(710)	(935)	(676)	(222)	-	-	-	-	-	-	-	-
Dairy Processing Facilities													
Sales[3/]	-	-	317	1,072	1,315	1,876	2,122	2,313	2,430	2,496	2,515	2,520	2,520
Operating Expenses:													
Central District	-	-	(316)	(571)	(717)	(900)	(942)	(1,043)	(1,043)	(1,105)	(1,119)	(1,119)	(1,119)
Honam District	-	-	-	(572)	(645)	(1,040)	(1,239)	(1,339)	(1,381)	(1,441)	(1,459)	(1,467)	(1,467)
Investments:													
Central District	-	(286)	(49)	(78)	-	-	-	-	-	-	-	-	-
Honam District	-	-	(333)	(15)	(121)	-	-	-	-	-	-	-	-
Management and Technical Services	(148)	(135)	(123)	(96)	(96)								
Subsidies[4/]	(81)	(114)	(172)	(91)	(57)	-	-	-	-	-	-	-	-
Balance	(629)	(1,412)	(1,733)	(891)	-	800	898	1,027	1,137	1,130	1,798	1,795	1,803

The internal rate of return is about 12%.

1/ The foreign exchange component of investment and operating expenses has been valued at a shadow rate of exchange of 400 Won/US$, against the on-going rate of 305 Won/US$.

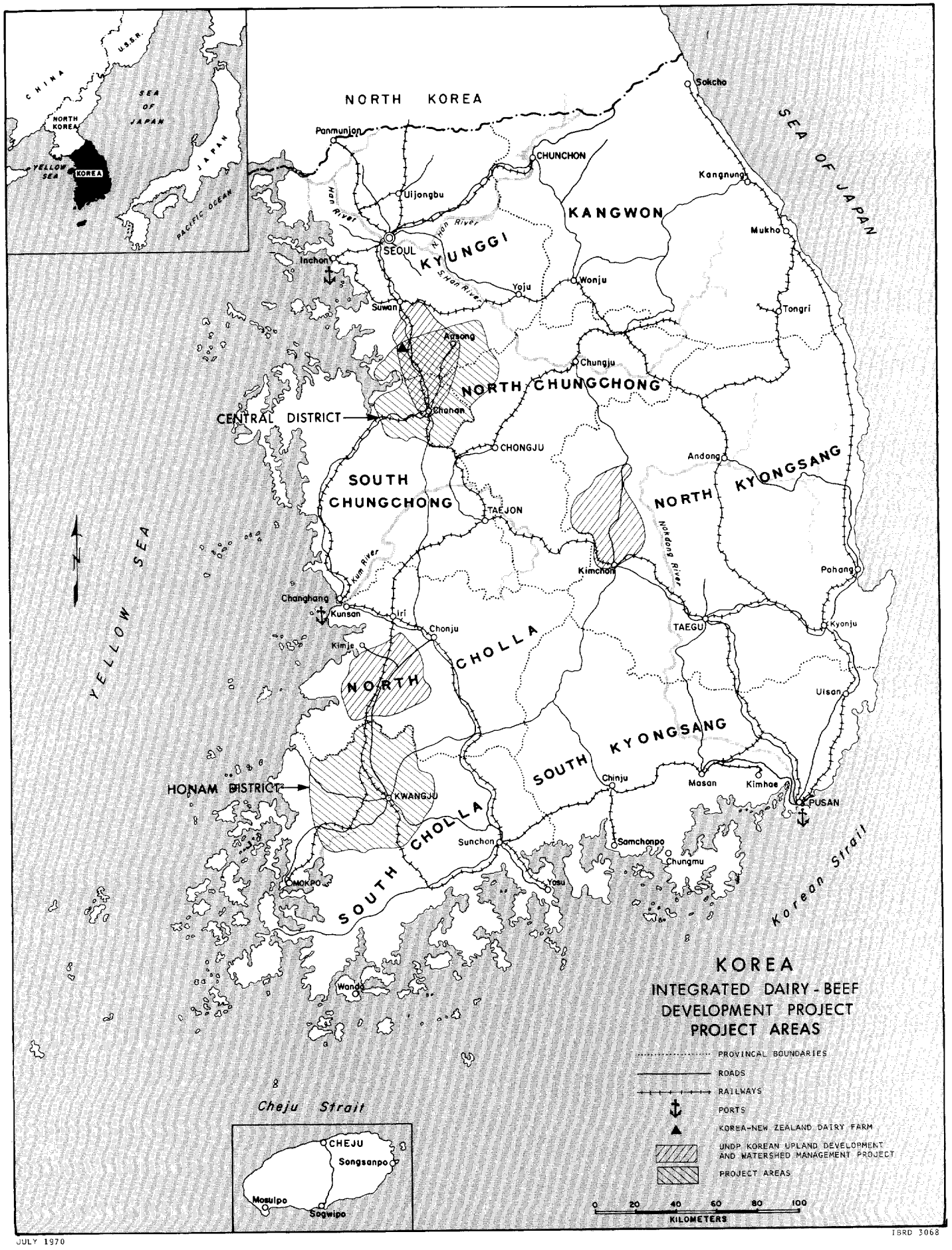
2/ Milk sales are an income to the farmer and an operating expense to the processing facilities that cancel each other out in the calculation of the annual balance.

3/ The sales of bottle milk and milk powders have been devalued by 25% and 15%, respectively, relative to the value at domestic market prices to reflect the contribution of these sales to the economy as an alternative to the importation of close substitutes.

4/ An average subsidy of 62,000 Won per ha of pastureland developed, plus about 80,000 Won per power tiller.

October 20, 1970

ANNEX 13



JULY 1970

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